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DOMINION OF CANADA—DEPARTMENT OF AGRICULTURE

CANADIAN POULTRY HANDBOOK

■

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THE RIGHT HONOURABLE JAMES G. GARDINER, MINISTER OF AGRICULTURE
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. . . Preface . . .

This handbook was first prepared by the New Brunswick Department of Agriculture under the authorship of Leslie Woods, Poultry Superintendent. It was originally intended for the use of boys and girls enrolled as members of the Poultry Clubs of that province.

The remarkable advancement of poultry husbandry during the past thirty years has been one of the outstanding features of agriculture on the North American continent. Poultry raising has been developed from a hobby to an important industry. All phases of the industry have made rapid progress. With that progress it is not surprising that new discoveries and new ideas have sometimes been given wider publicity and put to wider use than their importance warranted. In the preparation of this handbook the author has made an effort to emphasize essentials rather than passing fads, to recognize the possibilities which lie in recent inventions and research, and to present the material in a clear, concise and not too technical form.

A need has been apparent for some time for a publication of this kind that would prove equally useful to farm poultrymen throughout the Dominion. The present edition is published by the Dominion Department of Agriculture in collaboration with the New Brunswick Department of Agriculture. Mr. Wood has revised the text to give it more general application to the country at large. Considerable new material has been added and in this as well as in the general revision, officers of the several services of the Dominion Department of Agriculture, Experimental Farms, Science, Marketing and Production, have been freely consulted.

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LESSON 1

ANATOMY OF THE DOMESTIC FOWL

Topics for Study

1. Plumage.
2. Skin.
3. Skeleton.
4. Muscles.
5. Digestive system.
6. Respiratory system.
7. Circulatory system.
8. Nervous system.
9. Urinary system.
10. Reproductive system.
11. Development of the egg.
12. Structure of the egg.

Compared with other farm animals, chickens are fast living creatures. The rate of breathing, pulse rate and rate of digestion are faster than with horses, cattle, sheep, and swine. The body temperature is higher and, instead of being constant, varies at different periods of the day. While there are records of individual hens having lived to the age of 25 years, they are usually short-lived and their economically productive life is usually limited to one or two years. Chickens differ widely from other animals in possessing a coat of feathers rather than fur, wool, or hair and in the fact that the development of the young takes place outside the bodies of the mothers.

It is impossible to give here a detailed description of the chicken's anatomy but an attempt has been made to give enough information to add interest to the study of the domestic fowl and to explain certain accepted methods of management.

1. Plumage

The plumage of the chicken helps keep the body warm, protects it from injury, and makes flight possible. While the body appears to be completely covered with feathers, examination will show that they are arranged in distinct regions or tracts including the shoulder, thigh, rump, breast, neck, abdomen, leg, back, wings, and head.

Feathers differ in size and shape on different parts of the body. They are made up of the quill or round, hollow part attached to the body, the extension of the quill throughout the length of the feather known as the shaft and the barbs which branch from the shaft. The barbs branch to form barbules and the barbules branch in turn to form barbicels. The shaft with attached barbs is called the vane.

It is natural for birds generally to grow one new coat of feathers each year. The shedding of the old coat is called a moult and in the domestic fowl takes place during the late summer or early fall months. New feathers begin immediately to replace those which fall and the process is a considerable physical drain on the birds. The moult corresponds somewhat to the annual shedding of hair of horses and cattle but differs in that the latter takes place in the spring. Also the shedding of hair from horses and cattle takes place more or less generally over the body at the same time whereas with chickens, the feathers are moulted in a fairly definite order. This fact is made use of in evaluating hens for egg production and is explained in detail in Lesson 12.

In some breeds and crosses the colour of the down of the chicks is distinctly different in males and females at hatching time. In others the rate of feathering is faster with one sex than with the other. With some breeds the plumage colour of mature males is distinctly different from that of the females and with all breeds the neck, back and saddle feathers of the male are longer and more pointed than in the female. From this we see that differences in plumage are used quite extensively in distinguishing the sex of chickens.

2. Skin

The skin of the chicken has no sweat glands and body wastes are voided through the respiratory and urinary systems. The oil gland, located at the base of the tail, produces oil which is used by the birds in preening their feathers.

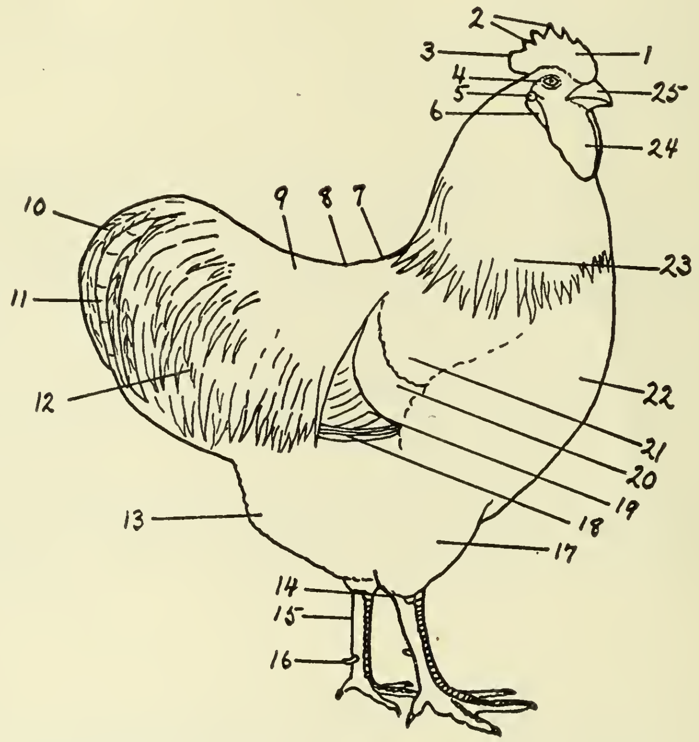


DIAGRAM SHOWING PARTS OF THE DOMESTIC FOWL

1. Comb
2. Points
3. Blade
4. Eye
5. Ear
6. Ear lobe
7. Cape
8. Back
9. Saddle
10. Sickles
11. Main tail
12. Saddle feathers
13. Fluff
14. Hock
15. Shank
16. Spur
17. Thigh
18. Primaries
19. Secondaries
20. Wing bar
21. Wing bow
22. Breast
23. Hackle
24. Wattles
25. Beak

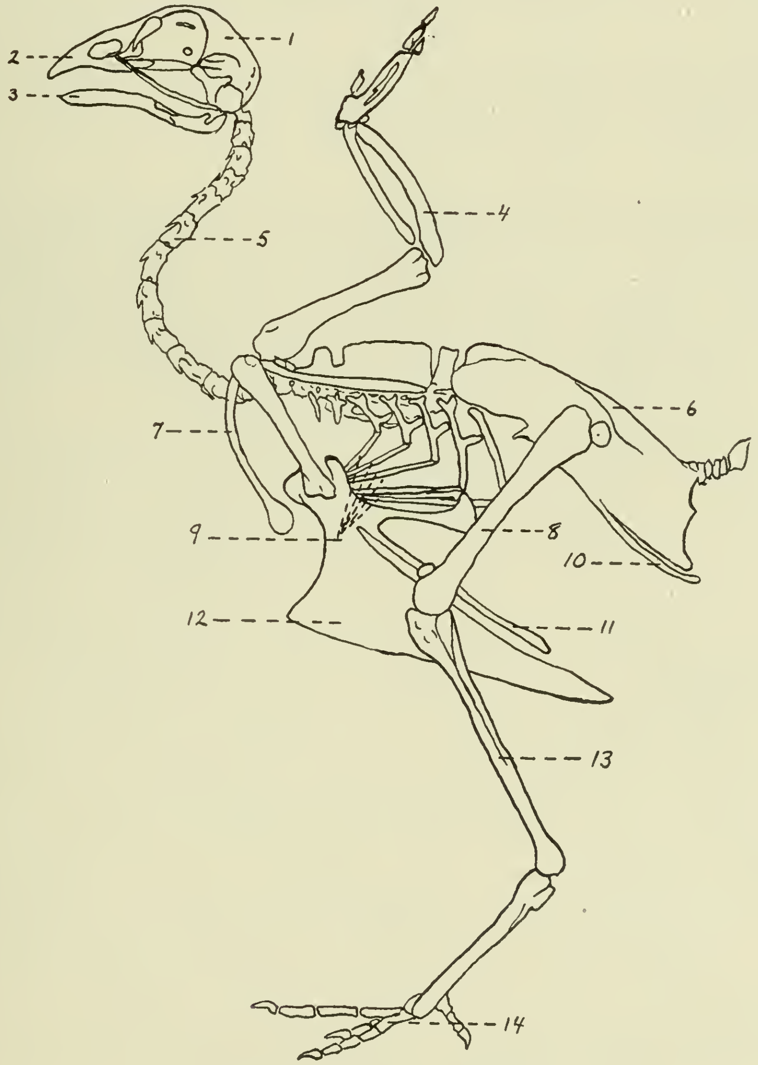
Most common breeds of poultry carry a yellow pigment in the skin although it is missing in a few well-known breeds including Orpingtons, Dorkings and Sussex. The shanks and toes of the chicken are covered with scales which are a specialized development of the skin. The breeds which lack pigment in the skin also lack it in the shanks which are white or pinkish white. Most breeds, however, carry one or more pigments in the legs and feet which may be yellow, green, blue, or black according to the variety. The yellow pigment of the skin and shanks fades out when hens are laying and reappears when egg production ceases. How to make use of this fact in culling hens is explained in Lesson 12.

Domestic chickens, and the wild jungle fowl of Asia from which they are supposed to have descended, are the only birds with which the head is decorated with a comb. The comb and wattles, like the leg scales, are specialized developments of the skin. The condition of the comb is an indication of the health of a chicken and also it has an association with the activity of the reproductive organs in both male and female. The rapid increase in size of comb and wattles in maturing cockerels and pullets about to begin egg production is well known. Condition of the comb is considered in the culling of a laying flock.

3. Skeleton

The skeleton of the chicken is light in weight and thus suited to a creature of flight. Strength is given by the keel-shaped breast bone which is quite unlike that of other farm animals and by the bones of the back, many of which are fused or grown together thus giving an armour-plate protection to the vital internal organs.

A wide variation in the bony framework of individual hens will be found when a flock is being handled to estimate their past egg production. Some of these differences are the result of egg production or lack of it and are used in culling work as described in Lesson 12.



SKELETON OF FOWL
(After O. Charnock Bradley)

1. Skull
2. Upper beak
3. Lower beak
4. Wing bones
5. Neck vertebrae
6. Fused bones of back
7. Wish bone
8. Thigh bone
9. Ribs
10. Pubic bone
11. Lateral process
12. Keel or breast bone
13. Drum-stick bone
14. Foot bones

4. Muscles

The most unusual feature of the muscular development of the chicken is that approximately half the total weight of body muscle is attached to the keel or breastbone. It is this muscle which provides the choice white meat that is sliced from the breast of a chicken and is the development which gives it the power of flight.

5. Digestive system

The digestive system of the chicken differs from that of both carnivorous (flesh eating) and herbivorous (vegetable eating) animals but resembles both in some particulars. The chicken is called an omnivorous animal—that is, it eats food of both animal and vegetable origin. Its digestive system is not designed to use bulky and fibrous foods as do the cud-chewing animals, but some bulky material is needed to prevent indigestion.

The digestive system includes the beak, mouth, gullet, crop, proventriculus or glandular stomach, gizzard, and the intestine with such accessory organs as the pancreas and liver.

(*a*) *Beak.*—The chicken lacks the lips and teeth of other farm animals and has, instead, a horny beak, which is used for tearing apart and picking up food.

(*b*) *Mouth.*—Hens have no teeth and cannot chew their food. Evidently they have little sense of taste. Food is never held in the mouth but is swallowed immediately.

(*c*) *Gullet.*—The gullet is the elastic tube through which the food passes from the mouth to the crop and thence to the glandular stomach.

(*d*) *Crop.*—The crop is an enlargement of the gullet, midway in its length, which serves as a storage place for food, somewhat as the paunch serves a similar purpose in cud-chewing animals. While here, the food is moistened and softened but little actual digestion takes place.

(*e*) *Proventriculus or glandular stomach.*—From the crop the food is carried through the second section of the gullet within the body cavity where it enters the proventriculus or glandular stomach. This organ is little more than an enlarged section of the gullet but its thickened walls secrete gastric juice which helps dissolve mineral matter and starts the digestion of proteins.

(*f*) *Gizzard.*—The gizzard is an oval-shaped organ, composed of two pairs of powerful muscles and has a thick, strong, and almost horny lining. Food enters the gizzard from the proventriculus and on leaving it, enters the small intestine. Fine food material passes very quickly to the intestine but coarse food is retained to be crushed and ground by the muscular action of the gizzard walls. The roughened lining of the gizzard and grit or gravel, which is always present in the gizzard when hens have access to it, assist in the grinding process.

(*g*) *Intestine.*—The intestine is the remaining section of the digestive system through which food passes during the process of digestion and assimilation. It has a length of about two and one-half feet and lies folded and coiled in the abdomen. The long loop of the intestine nearest the gizzard is called the duodenum. It encloses the pancreas which secretes a digestive fluid called the pancreatic juice. This fluid starts the digestion of fats and starches and carries the digestion of proteins to a further stage. The bile ducts enter the intestine near the lower end of the duodenum carrying the digestive fluid secreted by the liver, the bile, which assists in the digestion of fats as well as having more complicated functions. Food passes from the duodenum to the remaining section of the small intestine where other digestive juices are added which complete the digestion of proteins and carbohydrates. The small intestine, in addition to being an important organ in the process of digestion, is also the chief organ of absorption through which food material reaches the blood stream. What remains of the food, chiefly waste material, passes from the small intestine to the rectum or large intestine where the final absorption of food takes place. Waste material is voided through the anus or outward opening of the cloaca, which is the sac-like organ in which the rectum ends. At the junction of the small intestine and the rectum are the openings of the two blind pouches known as cæca (singular cæcum). The function of these is not definitely known but it is believed that they may help in the digestion of fibre.

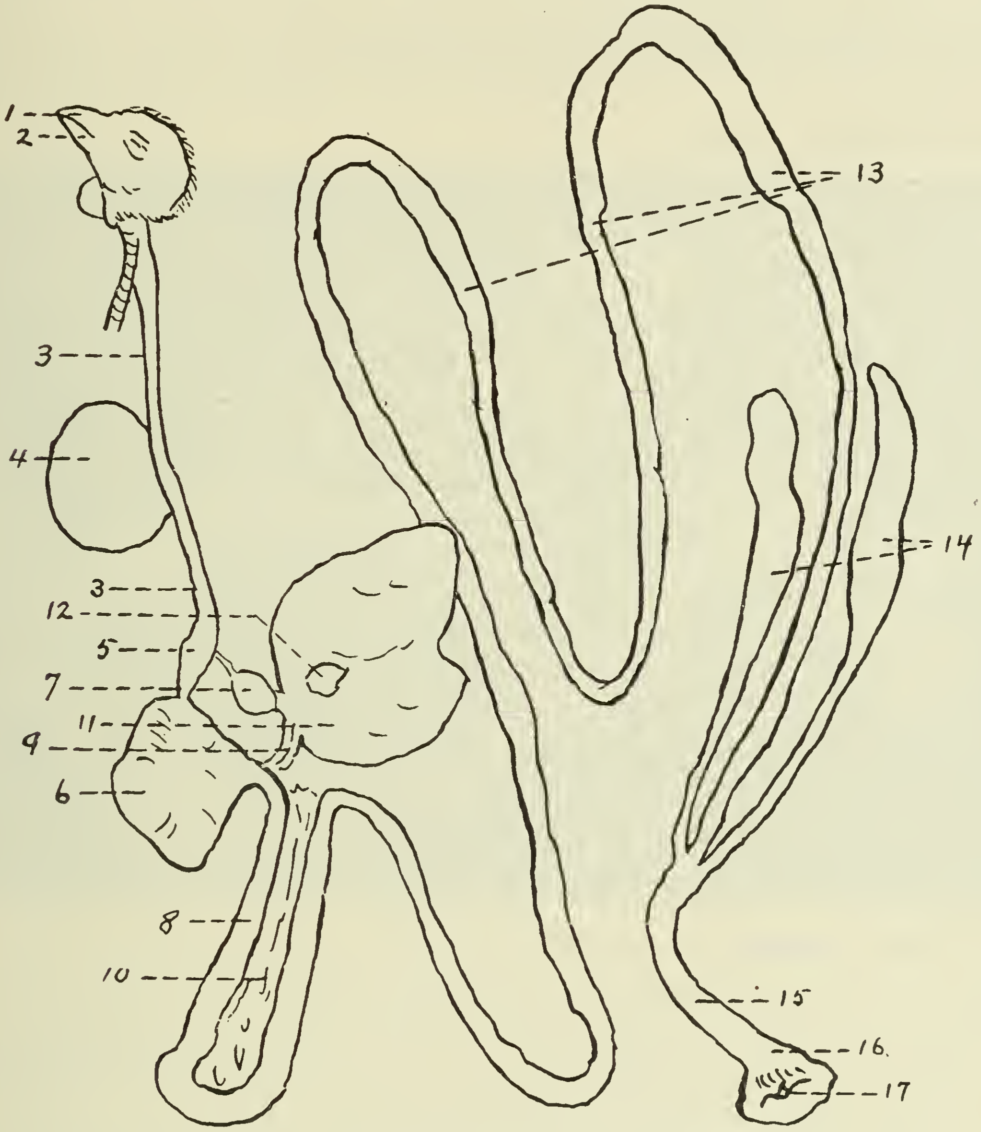


DIAGRAM SHOWING PARTS OF DIGESTIVE SYSTEM OF THE DOMESTIC FOWL

1. Upper beak
2. Lower beak
3. Esophagus
4. Crop
5. Glandular stomach
6. Gizzard
7. Spleen
8. Duodenum
9. Bile ducts
10. Pancreas
11. Liver
12. Gall bladder
13. Small intestine
14. Cæca
15. Rectum
16. Cloaca
17. Anus

(*h*) *Pancreas.*—This is a thin, elongated, pale yellow organ lying within the loop of intestine called the duodenum. Its function in digestion is to secrete the pancreatic juice as explained in the preceding paragraph.

(*i*) *Liver.*—The liver is a large, dark brown, soft-textured organ which performs several functions. The most important of these from the standpoint of digestion is the secretion of bile, which reaches the intestine through ducts as explained under the section above dealing with the intestine.

6. Respiratory system

The respiratory system consists of the nostrils, nasal chambers, pharynx, superior larynx, trachea, inferior larynx, bronchi, bronchial tubes, lungs, and air sacs. The lungs are encased in bone so that they are incapable of expansion and expiration, or breathing out, requires more effort than inspiration or breathing in, which is the opposite of other farm animals. The lungs have a connection with the seven air sacs of the body which in turn are connected with most of the hollow bones of the skeleton.

There are several highly infectious diseases affecting the respiratory tract of chickens which poultrymen must guard against.

7. The circulatory system

The circulatory system consists of the heart, arteries, veins, and lymphatic vessels. The heart is the muscular pump which forces the blood through the arteries and their branches to all parts of the body carrying with it food material and oxygen for the growth and maintenance of the body tissues. The blood returns to the heart laden with waste materials and after being purified is ready to repeat this cycle. The practical poultryman needs to know little of the circulatory system, except perhaps the location of the neck arteries which must be severed when killing by sticking. The research workers have, however, spent much time studying the condition of the blood in sickness and in health. The blood test used so generally in the control of pullorum disease is one result of this research work.

8. The nervous system

The nervous system consists of the brain, the spinal cord, and the nerves. The brain has three principal parts—the cerebrum, the cerebellum, and the medulla oblongata. The cerebrum is the largest part and lies in the large cavity in the upper part of the skull. The cerebellum lies back of and below the cerebrum while the medulla oblongata, which is the smallest section, connects the cerebellum with the spinal cord. When killing poultry by sticking, as described in Lesson 16, the feathers are most easily removed when the brain is pierced in the medulla oblongata.

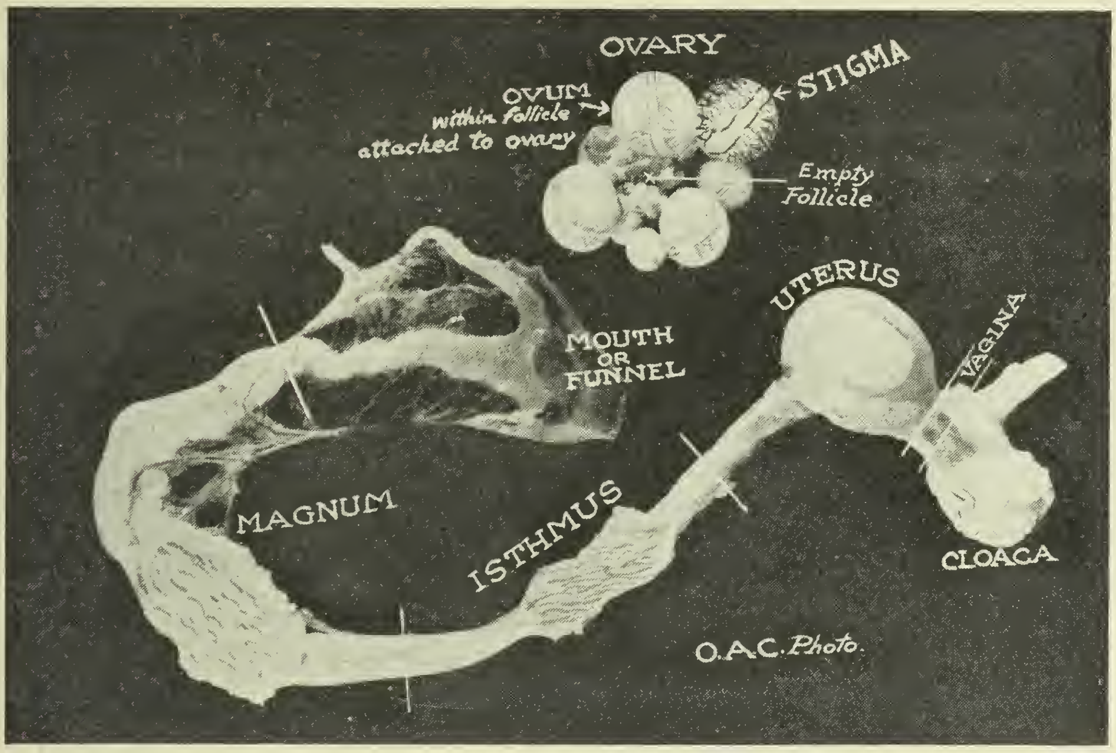
9. The urinary system.

The urinary system consists of two kidneys with small tubes, called ureters, connecting each with the cloaca. The kidneys filter waste products from the blood which are carried through the ureters and voided with the droppings. Unlike other animals, there is no urinary bladder. Liquid urine is produced but apparently the water content is absorbed by the walls of the cloaca because none is voided. The whitish deposit so often seen on poultry droppings is the waste material secreted by the kidneys. Each kidney is an elongated, three-lobed, brown-coloured organ that lies back of the lungs and embedded in the bones of the back.

10. Reproductive system

(*a*) *Male.*—The male reproductive system consists of two testes and the tiny tubes known as vas deferentia, which lead from the testes to the cloaca. The testes lie within the body cavity and close to the forward ends of the kidneys. Removal of the testes by operation is called caponizing and is described in detail in Lesson 14.

(*b*) *Female.* The female reproductive system is of special interest because it is the egg manufacturing apparatus of the hen. It consists of the ovary and the oviduct. The ovary is located on the left side of the bird, back of the lung and below the forward part of the kidney. In the laying hen it appears as a grape-like cluster of yellow ova or yolks varying in size from a fully formed yolk down to those too small to be seen by the unaided eye. The oviduct lies in the upper left side of the abdominal cavity and consists of five parts—funnel, magnum, isthmus, uterus, and vagina. It is a coiled tube through which the yolk passes when mature and in which the white of the egg or albumen is added and the shell formed. While not directly connected with the ovary, the oviduct has a funnel-like part which reaches upwards towards the ovary and receives each yolk as it matures and breaks away from the ovary. The length of time from when the yolk enters the oviduct until the egg is laid varies somewhat but is estimated to be about 24 hours.



REPRODUCTIVE ORGANS OF THE FEMALE DOMESTIC FOWL
(Photo, courtesy of Ontario Agricultural College.)

11. Development of the egg

The ovary of the pullet produces the ova or female reproductive cells. These are very small in the immature pullet and many can be seen only with the use of a microscope. Painstaking students have counted the ova and found the number to range from 900 to 3,600. Each ovum is a potential egg so we know that every pullet starts life with a number far in excess of the number of eggs that she will ever lay. As the pullet approaches maturity, some of the ova begin to increase in size at a very rapid rate. It is the enlarged ova which become egg yolks. Each is enclosed in a membrane and has a slender stalk-like attachment to the ovary. The yolks reach their full maturity one at a time and at this stage the surrounding membrane ruptures and the yolk enters the funnel of the oviduct.

The yolk remains in the funnel for only about 15 minutes and it is during this period that fertilization takes place. To make this possible, the male reproductive cells received by the female during mating must have worked their way upward through the entire length of the oviduct. It takes about three hours for the yolk to pass through the next section of the oviduct, the magnum, and it is here that most of the albumen or white is secreted and deposited around the yolk. Passage through the isthmus takes about an hour and fifteen minutes and during this period the egg receives more albumen and the two covering membranes. The final amount of albumen is received in the uterus and it passes through the membranes to enter the egg. The interior of the egg is now fully formed and shell making material is secreted by the walls of the uterus. Here the egg begins to take on its characteristic appearance and colour. The final colouring matter and the protective covering or bloom are added as the egg passes through the vagina. Passage of the egg through the uterus and vagina takes between 20 and 21 hours. Fertilization has been mentioned and is necessary for the production of hatchable eggs but has no effect on the number of eggs that will be laid.

12. Structure of the egg

The egg is made up of about 10 per cent shell, 60 per cent albumen and 30 per cent yolk.

(*a*) *Shell.*—The shell of the egg contains a very high percentage of calcium carbonate or lime. It is somewhat porous in nature but the pores are sealed to a considerable extent by the cuticle or "bloom". Washing will remove this bloom and permit a more rapid evaporation of the contents so is objected to in both market eggs and those intended for incubation.

(*b*) *Shell membranes.*—The egg shell is lined with two membranes which separate when the egg cools after being laid to form the well-known air cell in the large end of the egg. The size of the air cell increases with evaporation and takes place most rapidly when eggs are kept in a warm place. Size of the air cell can hardly be taken as an indication of the age of the egg but does reflect its quality and is a consideration when market eggs are being candled for grading. During incubation the size of the air cell is an indication to the hatcheryman as to whether or not he is providing sufficient moisture or humidity for best results.

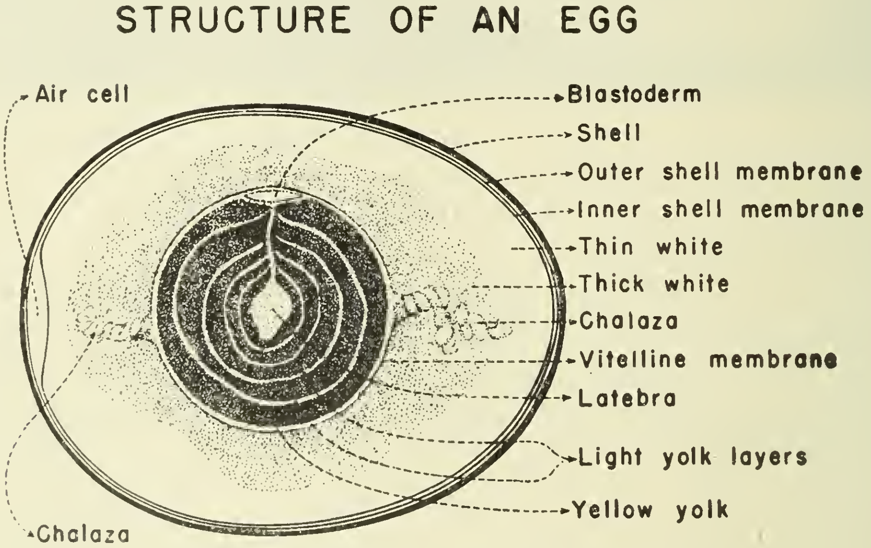


DIAGRAM SHOWING STRUCTURE OF AN EGG

(Photo, courtesy of Department of Public Relations, Ontario Agricultural College.)

(*c*) *Albumen.*—Within the inner shell membrane and surrounding the yolk is the most bulky part of the egg—the albumen or white. This consists of several layers of varying density. The outer layer is thin and watery and surrounds the dense albumen which, in turn, encloses an inner layer of liquid albumen. Surrounding the yolk and extending to each end of the egg are the twisted strands of albumen called the chalazae. These tend to hold the yolk in the centre of the egg and keep it from changing its position rapidly. The quality of egg albumen varies somewhat in new laid eggs and in all cases deteriorates as they grow older. References to quality of albumen will be found in Lessons 11 and 15.

(*d*) *Yolk.*—The yolk of the egg consists of several layers of light and dark material which is surrounded by a sac known as the vitelline membrane. Sometimes these colour layers can be easily seen in a hard boiled egg. The greater part of the light material is in the form of a flask-shaped mass in the centre of the yolk. The neck of the flask-shaped body extends outwards to the surface of the yolk and covering it is the germinal disk or blastoderm. Every yolk has a germinal disk when it is released from the ovary. If it is fertilized in the funnel of the oviduct it is then called a blastoderm. If not fertilized, the term germinal disk is retained. It is within this area that growth begins when the egg is incubated. Evidently there is a slight difference in the weight of the light and dark yolk material—just enough to make the yolk slightly lop-sided. This tendency keeps the mouth of the flask-shaped sac of light yolk and the blastoderm uppermost. It is believed that this is a provision of nature to bring the blastoderm close to the source of heat during incubation. After incubation begins the blastoderm is known as the embryo and after 21 days of incubation it emerges from the shell as a chick.

LESSON 2

BREEDS OF CHICKENS

Topics for Study

1. Origin of domestic chickens.
2. Classification of chickens.
3. The American Standard of Perfection.
4. American Class.
5. English Class.
6. Asiatic Class.
7. Mediterranean Class.
8. Other Classes.
9. Choice of breeds and varieties.

1. Origin of domestic chickens

The complete story of the origin of domestic chickens will never be known but some features regarding it seem reasonably certain. In the jungles of parts of India, Burma, Siam, and the island of Sumatra can be found today wild jungle fowl which bear a close resemblance to some varieties of our domestic chickens. It is generally believed that our light-weight breeds, such as Leghorns and Anconas, have descended from these jungle fowl. The heavy-weight breeds, such as Brahmas, Cochins, and Langshans, have a structural difference in the skull which makes it seem probable that they descended from a different species which has either become extinct or has gone entirely into domestication.

It is believed that the sport of cock fighting was responsible for the domestication of the fowl to a greater extent than man's need for human food. Later the excellence of both eggs and poultry meat was recognized and resulted in the spread of domestic poultry throughout the world. Pictures of fowls dating back five thousand years are found in the hieroglyphics of Oriental countries. From their natural habitat fowls spread northward and westward under domestication and seem to have been well distributed throughout the European countries at the beginning of the Christian Era. The familiar Biblical reference to the crowing of the cock following Peter's denial of Christ establishes the fact that domestic fowl were being raised in Palestine at that time. When European settlers began to establish colonies on the North American continent, they brought poultry with them, which we have reason to believe, resembled Leghorns in size and body shape. At a later date, heavy-weight birds reached America from China and the inter-breeding of the light- and heavy-weight fowls resulted in the organization of such common breeds as Plymouth Rocks, Rhode Island Reds, and Wyandottes.

2. Classification of chickens

Chickens can be classified in three ways: according to their place among living things or a biological classification; according to the accepted standards for breeds or a Standard classification; and according to their usefulness or an economic classification.

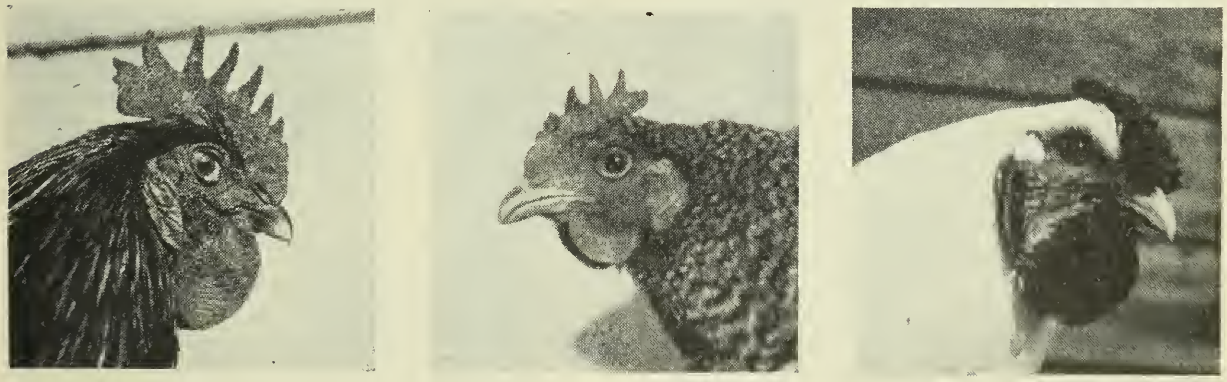
(*a*) *Biological classification.*—A detailed biological classification is rather technical and would be of doubtful value here. It is sufficient to say that chickens belong to the animal kingdom, they carry a coat of feathers, have a keel-shaped breastbone, are without teeth, the head bears a comb, they can fly but are not capable of long flight, and are well-adapted to running and scratching.

(*b*) *Standard classification.*—Poultry exhibitions became popular about the middle of the nineteenth century. Fanciers who exhibited at these shows became interested in the development of new varieties with the result that eventually there were in existence varieties so alike that they could not be distinguished apart. The confusion in judging which arose resulted in the organization of the American Poultry Association in 1873 for the purpose of standardizing the varieties of domestic poultry raised on this continent. In the following year this association published its first *American Standard of Excellence,* a book which described the recognized breeds and varieties of poultry. In later editions new breeds have been added, obsolete ones discarded, and changes made in weight, type, colour, or other characteristics to suit the ideals of the times. The name of this book was later changed to the *American Standard of Perfection* and it is very frequently referred to simply as *The Standard.* In the *Standard* method of classification, domestic poultry is grouped into classes, breeds, and varieties.

A "Class" is made up of one or more breeds that in most cases were developed within the same country. Thus, the Plymouth Rock, New Hampshire, and Chantecler breeds were all developed on the North American continent and are grouped with similar breeds to form the American Class. In the present *Standard* there are twelve Classes of chickens and one each for ducks, geese, and turkeys.

The term "Breed" is applied to a group of fowls having the same general body shape or type. Students of poultry judging will immediately recognize the distinct types of such breeds as Leghorns, Wyandottes, Rhode Island Reds, Brahmas, and Cornish.

A "Variety" is a subdivision of a breed having a distinct colour of plumage or type of comb. Wyandottes, for instance, are found with eight distinct colours of plumage and each is considered a variety. Rhode Island Reds are all of one colour but possess two types of combs (single and rose) and each is considered a variety.



TYPES OF COMBS

Left, single comb of New Hampshire male.

Centre, single comb of Barred Plymouth Rock female.

Right, rose comb of White Wyandotte male.

The following table shows the numbers of classes, breeds, and varieties that are described in the 1945 edition of *The American Standard of Perfection.* The figures for chicken classes include Bantams and where there is only one colour pattern in a breed it is listed as a variety.

No.	Classes	Breeds	Varieties
1	American	13	35
2	Asiatic	5	15
3	Mediterranean	8	24
4	English	7	19
5	Polish	2	18
6	Hamburg	2	7
7	French	4	5
8	Continental	2	3
9	Games	4	30
10	Orientals	4	6
11	Ornamental Bantams	6	12
12	Miscellaneous	2	2
	Total Chickens	59	176
13	Ducks	12	16
14	Geese	8	9
15	Turkeys	1	6
	Grand Total	80	207

(*c*) *Economic classification.*—From an economic standpoint, the breeds may be divided into ornamental and productive groups. The Bantams, Games, Polish, Sultans, and Frizzles are kept almost entirely for pleasure or curiosity and are examples of the ornamental group. Plymouth Rocks, Leghorns, Jersey Black Giants, and all others kept for the production of eggs or meat belong to the productive group. The latter group can be subdivided into egg, dual-purpose, and meat breeds. Leghorns are a typical example of an egg breed, Plymouth Rocks of a dual-purpose breed, and Brahmas of a meat breed. This grouping has some merit but has its faults. Brahmas, for example, produce meat of excellent quality but multiply and grow so slowly that they are not considered in the commercial production of poultry meat.

3. The American Standard of Perfection

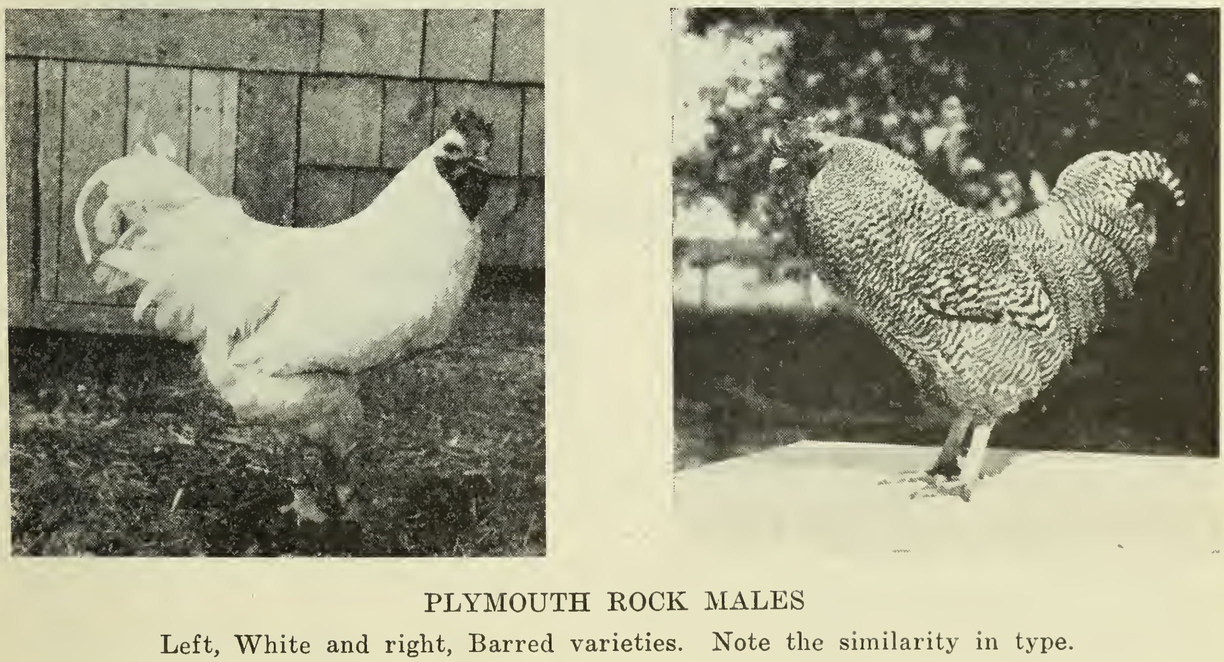
The book entitled *The American Standard of Perfection* is published by the American Poultry Association, Inc., which has its present headquarters in Davenport, Iowa, and contains the standards by which poultry is judged on the North American continent. *The Standard* contains a glossary of technical poultry terms, instructions to poultry judges, score cards for both day-old chicks and mature chickens, and a detailed description of each recognized breed and variety. No attempt is made to evaluate varieties nor is any advice given regarding matings. It is essentially a fancier's book although the more recent editions lay some stress on points in judging that are related to the utility value of the birds.

The Standard sets forth the size, shape, and colour that is ideal for mature males and females of every variety and also the colour of day-old chicks. In addition it lists the defects and disqualifications of each variety. A defect is a departure from the ideal such as four or six points on the comb where *The Standard* calls for five. Disqualifications are faults that are considered serious enough to debar the birds carrying them from winning prizes in exhibitions. Some are deformities while others are departures from the ideal type, size, or colour as described in *The Standard.* Typical examples of *Standard* disqualifications are wry tails, off-coloured plumage or shanks, stubs or feathers growing below the hock on clean-shanked breeds, absence of feathers on the shanks or feet of breeds that are supposed to carry them, and sprigs or points growing from the side of the bird's comb.

The constitution of the American Poultry Association, Inc., sets forth definitely the procedure that must be followed in getting a new breed or variety of poultry recognized and admitted to *The Standard.* A new variety is not necessarily required to have ancestry similar to the other varieties within a breed but must be similar in type or body shape.

4. American Class

The breeds of the American Class, with two exceptions, were developed in the United States to meet the particular market demands of that country. With few exceptions, they are medium in size and are typical dual-purpose birds—that is they produce both eggs and meat economically. They have yellow skin, legs are free of feathers below the hocks, and with one exception, their eggs have brown or tinted shells. Their ability to stand confinement well, coupled with the characteristics stated above, make them desirable and popular for farm flocks. They are more inclined to broodiness than the Mediterranean breeds but less excitable and easier to manage. Their eggs have good fertility and hatchability although, in general, they do not equal the Mediterranean breeds in these respects. The American breeds include Plymouth Rocks, Plymouth Rock Bantams, Wyandottes, Wyandotte Bantams, Javas, Dominiques, Rhode Island Reds, Rhode Island Red Bantams, Rhode Island Whites, Chanteclers, Jersey Black Giants, Lamonas, and New Hampshires. Five varieties of these breeds have commercial importance in Canada and, in the descriptions which follow, a sixth is included because it belongs to the only breed of Canadian origination.



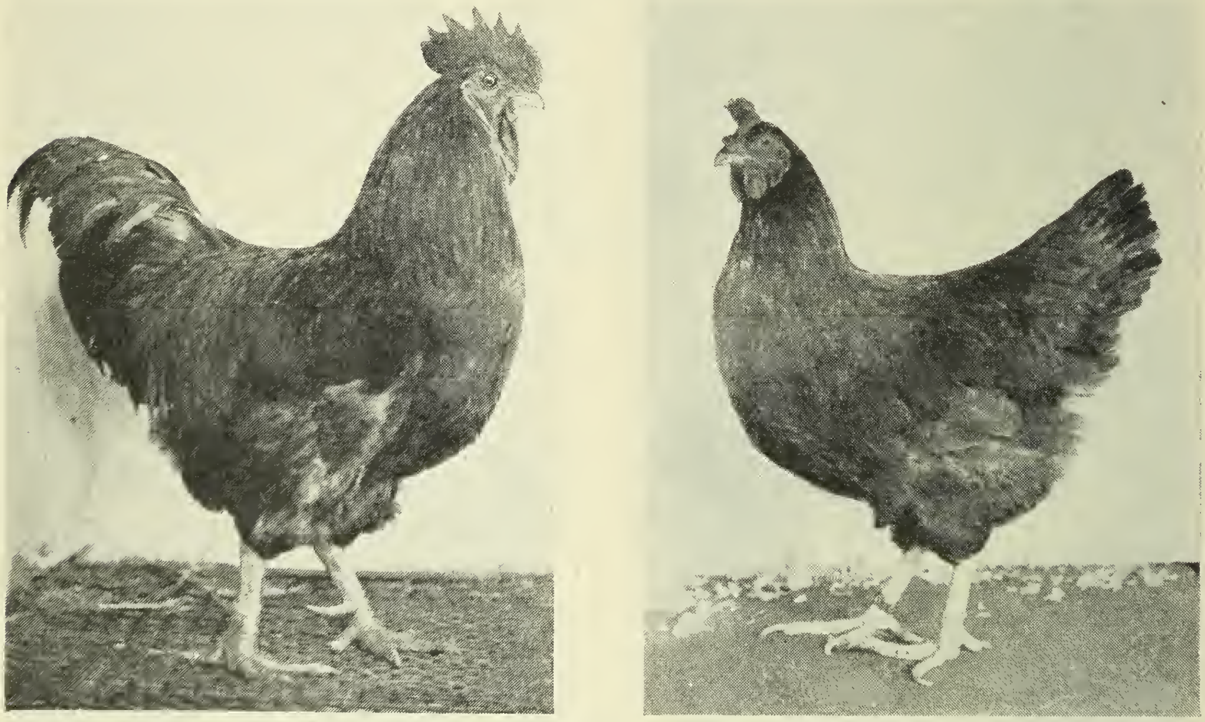
PLYMOUTH ROCK MALES

Left, White and right, Barred varieties. Note the similarity in type.

(*a*) *Barred Plymouth Rock.*—This is the oldest and most popular variety of Plymouth Rocks. Its popularity seems to be due to its excellence for meat production and the fact that some very high egg laying strains exist as the result of breeding to improve its egg production. This variety produces excellent broilers, roasters, and capons. The plumage colour is distinctive, the feathers carrying parallel bars of greyish white and almost black at right angles to the shaft. In males the light and dark bars are typically of equal width while in females the dark bars are about twice the width of the light bars. While dark coloured pin feathers of this variety detract from the appearance of the dressed poultry, it is not unusual for markets to pay a premium for them. Late maturity and slow feathering are serious faults of some strains but efforts towards the development of fast-feathering strains have been producing results in recent years. This variety has been criticized as lacking vitality and undoubtedly this has been true of some strains but improvement in this regard can be made by a better balanced selection of breeding stock.

In this and other Plymouth Rock varieties the *Standard* weights for mature males and females are $9\frac{1}{2}$ and $7\frac{1}{2}$ lb. respectively. It has been said that in body shape Plymouth Rocks resemble a gravy dish and this aptly describes their type.

(*b*) *White Plymouth Rock.*—This variety has pure white plumage colour and originated as a "sport" or mutant of the Barred variety. Since it is easier to breed a variety having a solid-coloured plumage to conform to *Standard* requirements than one that has barred plumage, it is regrettable that the work of developing egg laying strains was not done with the White variety rather than with the Barred. While excellent for meat production, this variety has not gained the popularity for egg production that the Barred variety enjoys.



NEW HAMPSHIRES

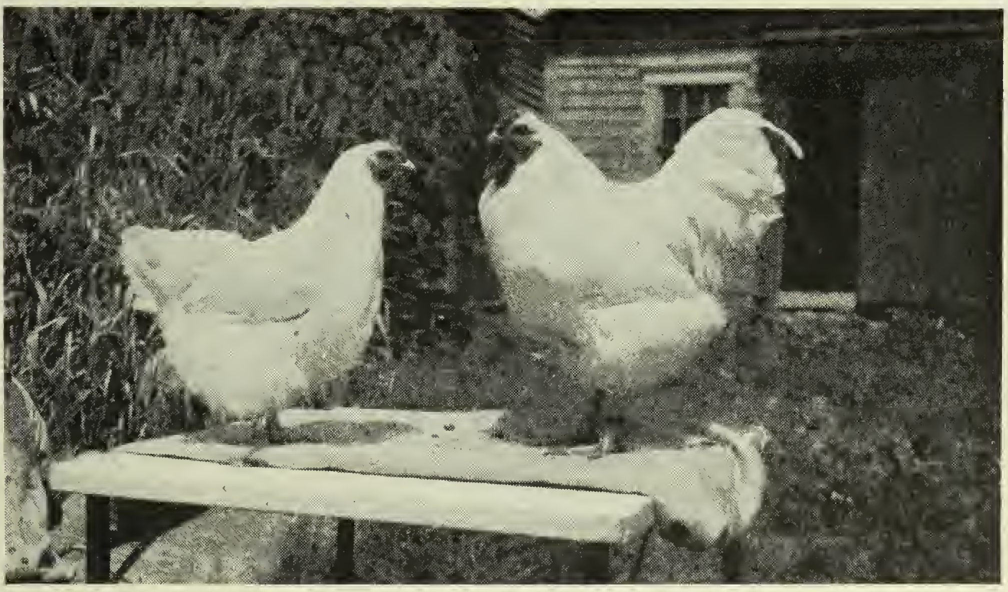
Left, male and right, female.

(Photos, courtesy of Canadian Poultry Review.)

(*c*) *Single Comb Rhode Island Red.*—The Rhode Island Red breed was developed in the New England States and the Single Comb variety has long been popular there for the production of both eggs and meat. The *Standard* weight for mature males is 8½ lb. and for females 6½ lb. In type, the Rhode Island Red is longer in the body than the Plymouth Rock and can be described as being somewhat brick-shaped. The plumage colour is a rich and even red throughout. Slow maturity and a persistent broody tendency are faults of some strains.

(*d*) *New Hampshire.*—This breed was developed in the state for which it is named and is the most recently admitted breed of the American Class to *The Standard.* It has been developed from Rhode Island Red stock through selection for a somewhat different body shape and plumage colour, for vigour, fast feathering, early maturity, and the production of large brown eggs. *Standard* weights are 8½ lb. for cocks and 6½ lb. for hens. In type, New Hampshires resemble Plymouth Rocks more closely than Rhode Island Reds. The typical plumage colour is a lighter and more brilliant red than that of the Rhode Island Red and with considerable variation in shade of colour in different parts of the body. Difficulty in getting a well-fleshed breast while fattening is a common criticism of this breed.

(*e*) *White Wyandotte.*—The plumage colour of this variety is pure white in all sections and *Standard* weights are 8½ lb. for mature males and 6½ lb. for hens. The Wyandotte is a bird of curves and the general shape is that of a ball. The back is comparatively short and looseness of feathers contributes towards its spherical appearance. The Wyandotte produces an attractive carcass either as a broiler or a roaster and high egg records have been made by some hens. It is apparent that continued selection for the recognized type has injured the breed from the standpoint of both egg production and fertility.



WHITE WYANDOTTES

Left, female and right, male.

(*f*) *White Chantecler.*—This variety was developed at the Oka Agricultural Institute in the Province of Quebec, the aim being to produce a good general purpose fowl that will lay well under severe winter weather conditions. *Standard* weights are 8½ lb. for cocks and 6½ lb. for hens. The type is somewhat like that of Rhode Island Reds and the plumage colour is white throughout. The head trimmings, comb and wattles, are very small and therefore little subject to damage from freezing.

5. English Class

The varieties in the English Class are Dorkings, Redcaps, Orpingtons, Cornish, Cornish Bantams, Sussex, and Australorps. These breeds vary greatly in type but are mainly dual-purpose birds. All the English breeds have white skin except the Cornish which is yellow-skinned. Dorkings and Redcaps lay white-shelled eggs while the remaining breeds lay eggs with brown or tinted shells. The Light Sussex is the only variety in this class which has commercial significance in Canada at present but four varieties merit a brief description.

(*a*) *Light Sussex.*—This variety has gained considerable popularity in Canada in recent years both in the purebred state and when crossed with other breeds. The Standard weight for adult males is 9 lb. and for females 7 lb. The type is somewhat similar to that of Plymouth Rocks. This variety has Columbian colour markings which can briefly be described as white with black tail, wing, and neck feathers. Birds of this variety are good egg producers and produce plump and attractive carcasses. The white skin is an advantage in producing "milkfed" poultry. The chief fault of the variety seems to be its tendency to broodiness.

(*b*) *Buff Orpington.*—This variety has lost some of its former popularity in Canada. The Standard weights are 10 lb. for cocks and 8 lb. for hens. Orpington type resembles that of the Plymouth Rock but is deeper in the body and the birds are more loosely feathered. They are reasonably good layers and produce an excellent carcass.

(*c*) *Australorp.*—The Australorp was developed in Australia from Orpington stock with egg production being the principal consideration. The *Standard* weight for mature males is 8½ lb. and for females 6½ lb. The birds are less massive in appearance than Orpingtons and in type more closely resemble Plymouth Rocks. The plumage colour is a lustrous greenish black which with their bright red head trimmings makes them very attractive in appearance.

(*d*) *Dark Cornish.*—The Cornish breed was developed in Cornwall, England, but differs so much in type from other English breeds that it seems out of place in this class. *Standard* weights are 10½ lb. for mature males and 8 lb. for females. Cornish type is unlike that of any other breed and the bodies of male and female are alike in conformation. The body is compact and the feathers are so close-fitting that the birds are much heavier than they appear. The legs are set very widely apart and the breast is deep and broad and especially well rounded out with muscles. The Cornish is noted for the quantity and quality of the meat on the carcass and while little raised in Canada, has been used to a limited extent in crossing with other breeds for the production of market poultry.

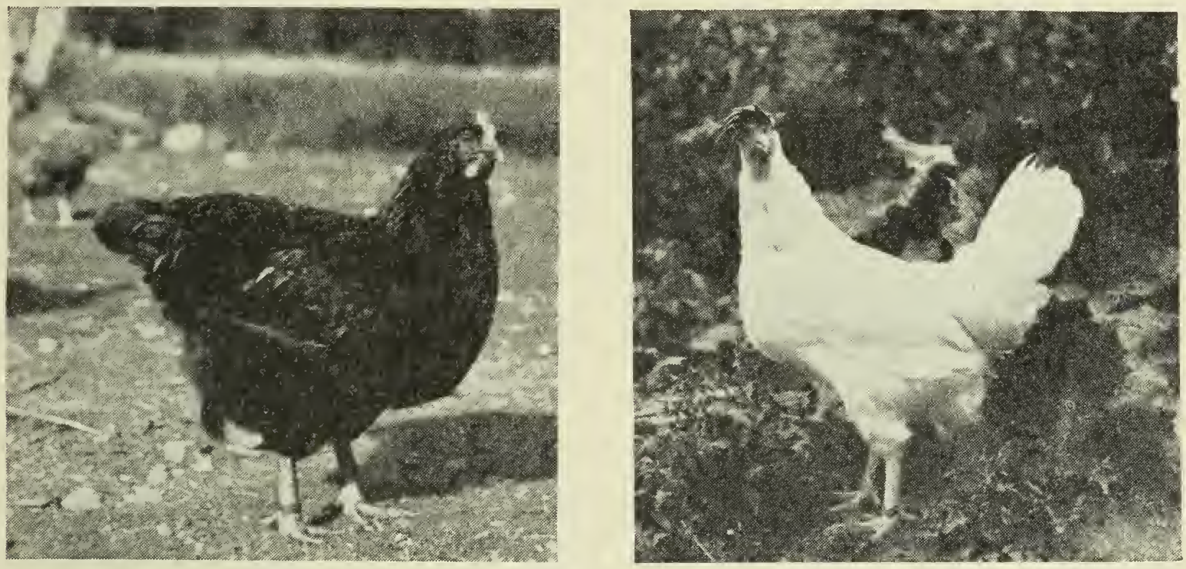
6. Asiatic Class

The Asiatic Class includes Brahmas, Brahma Bantams, Cochins, Cochin Bantams, and Langshans. The birds of this class, excepting Bantams, are large in size and produce meat of excellent quality but are relatively poor egg producers. The shanks and feet are feathered which gives them a distinctive appearance. Apparently their usefulness has suffered because of selection for extremely heavy feathering and they are of little economic importance in Canada at the present time. They were used extensively in the devlopment of several popular breeds including Plymouth Rocks, Rhode Island Reds, and Wyandottes.

7. Mediterranean Class

The breeds in this class are Leghorns, Leghorn Bantams, Minorcas, Minorca Bantams, Spanish, Blue Andalusians, Anconas, and Buttercups. They were developed in the countries surrounding the Mediterranean Sea. The birds of most of these breeds are small in size and have been specially developed for high egg production. The two most common varieties are described.

(*a*) *Single Comb White Leghorns.*—This is the most popular variety for the commercial production of eggs. The *Standard* weight for cocks is 6 lb. and for hens 4½ lb. The birds are small in size, slimly built, and with large comb, wattles, and tail. The comb of the female lops to one side while that of the male is carried erect. The plumage is white in all sections and ear lobes are white. Much work has been done to develop egg laying strains of this variety and, as a result, they are the most economical producers of eggs. Leghorns are very active and inclined to nervousness unless handled carefully. Because of their small size, they require less floor space and less feed per bird than do birds of the American breeds. They produce reasonably good broilers but in general are not highly rated for the production of meat. Leghorns are less inclined to broodiness than any other common breed.



VERY DIFFERENT IN TYPE AND SIZE

Left, female Jersey Black Giant.

Right, female Single Comb White Leghorn.

(*b*) *Single Comb Black Minorcas.*—These are the largest of the Mediterranean breeds, mature males having a standard weight of 9 lb. and females 7½ lb. The back is longer than with the Leghorn and they lack the graceful appearance of that breed. The plumage colour is a lustrous greenish black. Comb and wattles are very large and subject to freezing and, probably because of this, Minorcas are raised less in Canada than formerly. They lay very large white eggs but because of having white skin and black plumage the carcass is rather unattractive in appearance.

8. Other Classes

The remaining classes listed in *The Standard* are Polish, Hamburg, French, Continental, Games, Orientals, Oriental Bantams, and Miscellaneous. Some of these classes have several breeds and varieties. Many of these are bred in small numbers by fanciers and are frequently seen at the larger poultry exhibitions. Some are almost entirely ornamental but most of them have some value as producers of human food. In general, they have not been developed to the point that they have great economic value in Canada.

9. Choice of breeds and varieties

The beginner in poultry raising should give some consideration to the choice of breed and variety with which he starts. The table given in Section 3 of this lesson shows that there are 176 *Standard* varieties. If a poultryman intends raising birds for pleasure it is logical that he should select the variety that pleases his fancy. If, on the other hand, he plans on raising poultry as a means of making a living, he should remember that there are scarcely more than half a dozen varieties that have commercial possibilities.

The knowledge of what breeds are popular and profitable in any district will help a beginner in making a choice of varieties. Departments of Agriculture can give useful guidance in this matter. There are usually practical reasons for the popularity of any variety and the chance of success is greater with a variety that is popular than with one that is not. It is easy to get stock of a popular variety, easy to renew it when blood is needed, and the chances of selling surplus stock to other breeders is better than with a variety that is less commonly raised. The person who is raising poultry for a livelihood will soon learn to like a variety that is profitable. No breed or variety remains popular unless it gives reasonably good egg production.

LESSON 3

PRINCIPLES OF HOUSING POULTRY

Topics for Study

1. Poultry house requisites.
2. Location.
3. Dimensions.
4. Floor space.
5. Air space.
6. Building materials.
7. Roof types.
8. Light.
9. Ventilation.
10. Temperature.
11. Artificial heating.
12. Insulation.

It is believed, as explained in Lesson 2, that our domestic fowls have descended from the wild jungle fowl of southeastern Asia. The jungle fowls lived, as do our wild birds, without the protection of houses. Hens will survive Canadian winters with comparatively little protection but they must be made comfortable, contented, and happy if we are to get good egg production from them.

1. Poultry house requisites

The requirements of a poultry house that will provide comfortable conditions for the hens and be equally satisfactory from the owner's standpoint are: protection for the flock, good ventilation, ease in cleaning, provision for the admission of sunlight, economical construction, and convenience in both location and interior arrangement.

(*a*) *Protection.*—Protection is needed against the extremes of temperature, draughts, and animal enemies. Excessive heat sometimes results in mortality among laying hens and excessive cold lowers the productivity of hens and the vitality of male birds.

(*b*) *Ventilation.*—Good ventilation is needed to supply oxygen to the birds and to remove the waste products of respiration. Hens give off more moisture in their breath in proportion to their body weight than other animals. This moisture will condense if it comes in contact with any cold surface and is the most common cause of litter dampness in poultry houses. Dampness in the air and litter retards the activity of the hens and creates conditions favourable for the multiplication of disease organisms.

(*c*) *Ease in cleaning.*—Cleanliness has a bearing on the comfort and health of the flock. The house should be built so that it can be cleaned and disinfected easily and thoroughly. This requires a smooth, tight floor, walls with as few hiding places for vermin as possible, and interior fittings that can be removed easily for cleaning.

(*d*) *Importance of sunlight.*—Sunlight is important in maintaining the health of the flock and has considerable disinfecting value. A well-lighted house is more agreeable for both the birds and the caretaker and is more likely to be kept clean than a poorly lighted building.

(*e*) *Economical construction.*—The poultry house should be built as economically as possible, consistent with durability. The actual cost of a well-built house will vary with fluctuations in the prices of building materials, grades of materials used, and with the locality. It is plainly unwise to burden the business with needless overhead, but efficiency and durability should not be overlooked in the effort to reduce costs.

(*f*) *Convenience.*—Convenience should be considered both in the house and in its location. If poultry houses are conveniently located in relation to other farm buildings and so constructed that the necessary daily care requires a minimum of effort, the attendant will find his work more enjoyable and the birds will receive better care. Convenient interior fittings for the feeding, watering, and general care of the flock will save many steps. A feed room is a convenience that should be included when building a large laying house.

2. Location

Before building a new poultry house, the location should be studied and a site chosen that has the greatest possible number of advantages. The land should have good drainage and the lighter types of soils are preferred to the heavy clay soils. Ventilation is important but there should be protection from high winds. It is desirable that the house receive an abundance of sunlight through its windows and, to get a maximum amount, it should face in a southerly direction. This does not imply that a southern exposure is indispensable. Good results have been secured from houses facing southeast, southwest, and even east or west. The slope of the land, the location of other buildings, windbreaks, the layout of roads, and other factors will have a bearing on the choice of direction in which the house will face, but it should be kept in mind that a southern direction is preferred. The importance of a good water supply cannot be over-estimated.

3. Dimensions

Ideas regarding poultry house dimensions have changed greatly in recent years. Only a few years ago 16 feet was looked upon as being the ideal width for a laying house, but at present 20 feet is considered about the minimum that will give the best housing conditions and widths of 24, 30, and 36 feet are fairly common. Those who have used the wider houses think that 40 feet is not too wide for a large capacity house. With the wider houses it is usual to have larger pens and the labour in caring for the flock is greatly reduced. The narrow houses are cold, draughty, and damp as well as being more costly to build because of their greater amount of wall area. Multi-storied buildings have become common in Eastern Canada and have proved to be practical and economical for large-sized flocks.

The slogan "One hundred hens on every farm" heard so generally 20 years ago has been replaced by "Thirty or three hundred layers". Experience has shown that a flock of 100 layers is not large enough to be a very efficient commercial unit and larger than necessary to supply the household needs in eggs and poultry meat. The modern trend with those who intend to make poultry raising an important sideline on their farms is towards flocks of larger size.

The following dimensions should be helpful to those who are planning the erection of new poultry houses. They are based on the usually accepted recommendation of 4 square feet of floor space for each bird of American and English breeds and 3½ square feet for Leghorn and other small breeds. In practice less space per bird is allowed as pens are increased in size and some reduction is shown in the following figures.

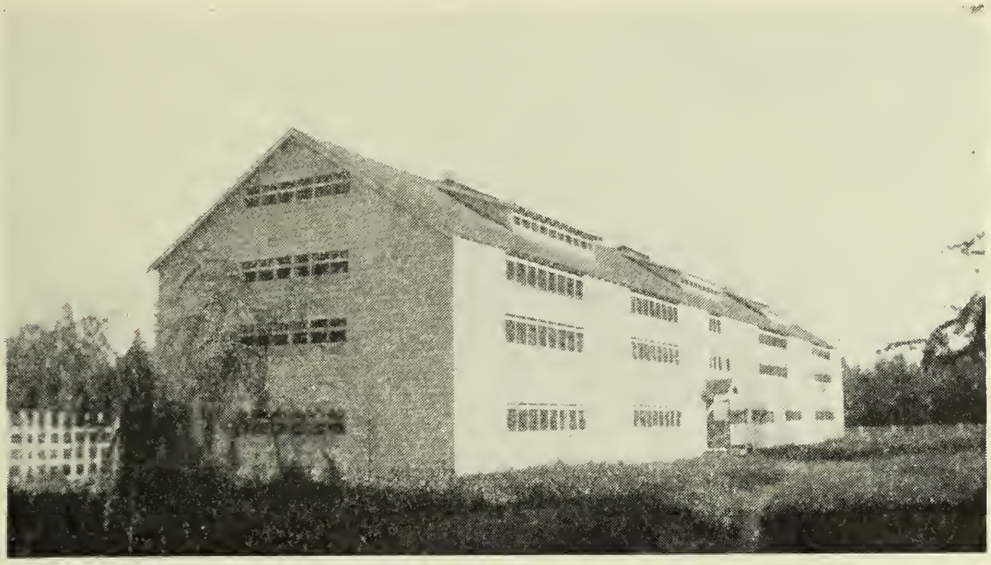
For 25 to 30 hens a 10- by 12-foot colony house.

For 200 Plymouth Rock or 230 Leghorn layers a 20- by 40-foot house with two pens, each 20 by 20 feet in size.

For 300 Plymouth Rock or 350 Leghorn layers a 24- by 48-foot house with two pens, each 24 by 24 feet in size.

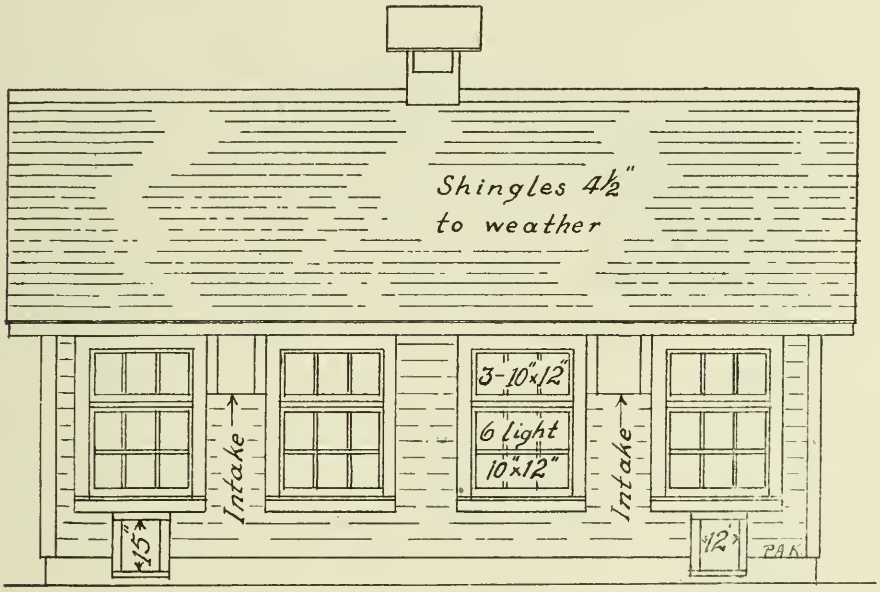
For 1,000 Plymouth Rock or 1,150 Leghorn layers a two-storey 30- by 60-foot house having four pens, each 30 by 30 feet in size.

For 5,000 Plymouth Rock or 5,750 Leghorn layers a three-story 36- by 180-foot house having fifteen 36- by 36-foot pens.



LARGE CAPACITY LAYING HOUSE

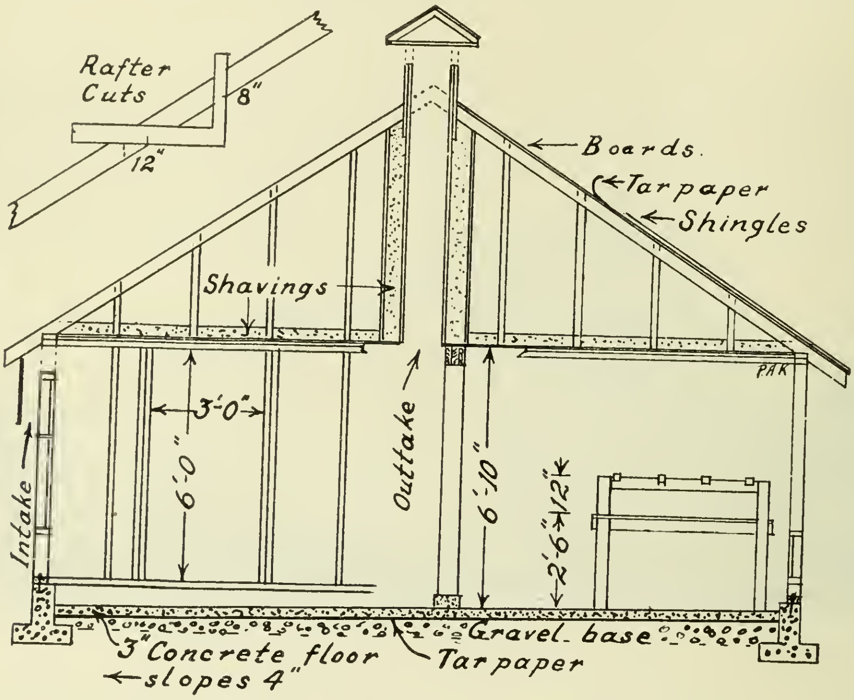
This house is 32 by 180 feet in size and accommodates 6,000 laying hens.
(Photo, courtesy of Swensson's Poultry Breeding Farm, Aldergrove, B.C.)



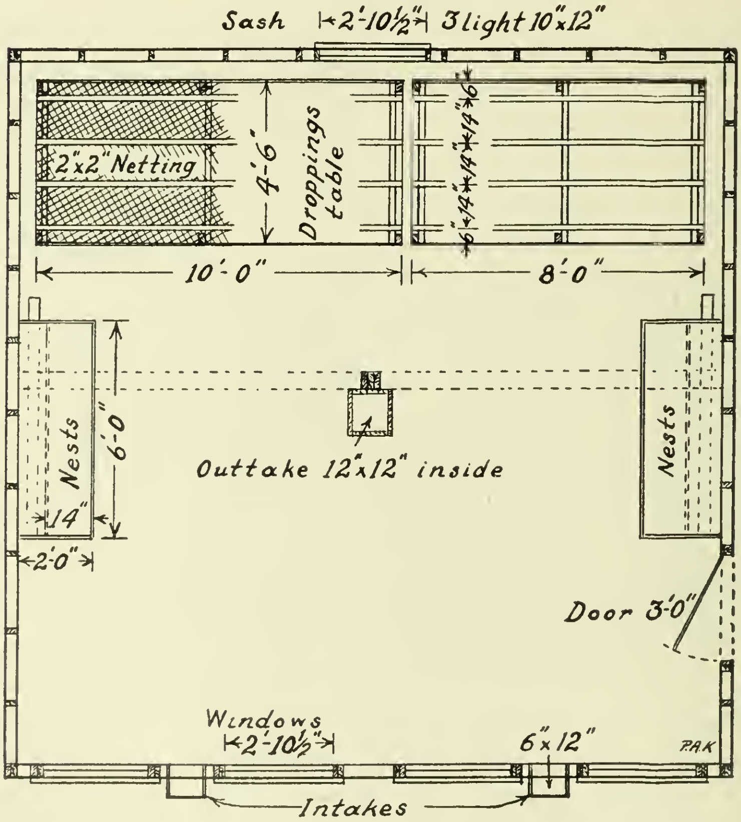
FRONT VIEW 20- BY 20-FOOT LAYING HOUSE

Suitable for 100 laying hens. Note the flue ventilation.
(Drawing, courtesy of the University of Manitoba.)

The above dimensions make no allowance for feed rooms which are necessary and should be provided in large poultry houses. In a building with only one or two pens, a small storage bin may provide all the space necessary in which to hold a convenient feed supply. The size of feed room needed will depend on the size of the poultry plant. It will frequently be found profitable to buy feed considerably in advance of immediate requirements in order to take advantage of favourable prices. This fact should be given due consideration in planning the space allotted to feed storage. The feed room should be centrally located. In a long laying house it is usually placed in the centre of the building and in multi-storied buildings it may be advisable to have a feed room on each floor. The possibility of an increase in the size of the flock at some later date should be considered when planning poultry buildings.


Rafter Cuts
8"
12"
Boards.
Tarpaper
Shingles
Shavings
3'-0"
6'-0"
Outtake
6'-10"
2'-6"
12"
Intake
3" Concrete floor
slopes 4"
Gravel base
Tarpaper
P.A.K.

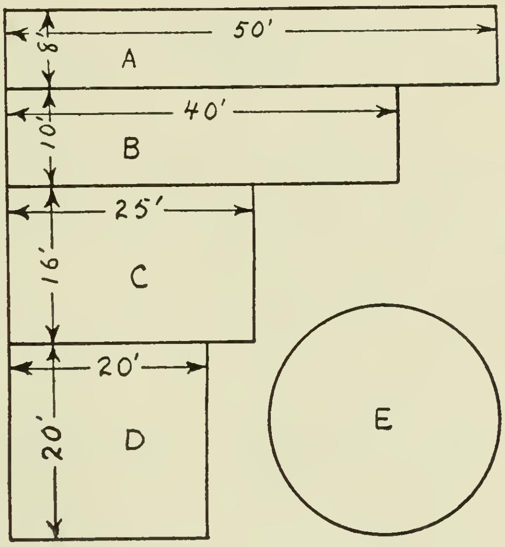
SECTION 20- BY 20-FOOT LAYING HOUSE
(Drawing, courtesy of the University of Manitoba.)


Sash
2'-10½"
3 light 10"x12"
2"x2" Netting
4'-6"
Droppings table
6" 14" 14" 14" 6"
10'-0"
8'-0"
Nests
6'-0"
14"
2'-0"
Outtake 12"x12" inside
Nests
Door 3'-0"
Windows
2'-10½"
6"x12"
Intakes
P.A.K.

FLOOR PLAN 20- BY 20-FOOT LAYING HOUSE
See Lesson 4 for photograph of house built after the drawings here shown.
(Drawing, courtesy of the University of Manitoba.)

4. Floor space

Several factors, including the breed of hens kept, the size of the pens, and the method of feeding, have a bearing on the amount of floor space which should be allowed for each laying hen. The usually accepted rule is that 4 square feet of floor space should be allotted to each bird of American or English breeds and 3½ square feeet for each bird of Mediterranean breeds. In warm climates where the birds are on range throughout the year, 2 square feeet per bird may be possible. As the size of the pen is increased, the amount of floor space can be decreased somewhat but it should be remembereed that the problems of providing ventilation and preventing such vices as feather pulling and cannibalism become greater as the amount of floor space per bird is decreased.



COMPARISON OF DISTANCE AROUND A GIVEN AREA

The area in each case is 400 sq. ft., this being the amount of floor space usually allotted to 100 hens. This chart illustrates the increased amount of wall space in a narrow house.

A. Distance around, 116 feet.
B. Distance around, 100 feet.
C. Distance around, 82 feet.
D. Distance around, 80 feet.
E. Distance around, 71 feet.

5. Air space

Hens require about three times as much air space in proportion to their weight as do human beings or cattle and about two and a half times as much as horses. In practice, no special attention is paid to providing air space because if the ceiling of the poultry house is high enough that the caretaker can work in it comfortably, it will contain at least twice as much air space as is necessary for the flock.

6. Building materials

Local conditions will affect the choice of building materials to some extent but the following information will be helpful in most sections.

(*a*) *Foundation.*—Concrete is the most suitable material for a poultry house foundation. The wall should have a footing and usually it is not necessary to go below the frost line. The thickness will depend on the size of the building to be carried. If there is danger of water lying beneath or against the foundation it is advisable to lay a line of 3-inch drainage tile around the footing, leading to a suitable outlet and with enough fall to carry away the water. On level ground, the earth should be graded up to the foundation so that there will be some slope in every direction from the house. Half-inch bolts about 8 inches long should be set in the foundation wall for the purpose of securing the sills.

(*b*) *Walls.*—Frame construction is most commonly used for walls. In smaller buildings, 2- by 4-inch scantling is used for both studding and rafters and is placed at 2-foot centres. For larger buildings and where additional space is wanted for insulating material, 2- by 6-inch material is used. Ceiling joists are usually of 2- by 6-inch material and in the wider buildings they must be supported by one or more beams or carrying timbers which in turn are supported with pillars.

Tiles, logs, sods, and straw are all used to some extent for poultry house walls to meet special conditions.

(*c*) *Floors.*—Concrete floors are most satisfactory for the ground floors of poultry houses. They are permanent, sanitary, and rat proof. In preparation for putting down a concrete floor, a layer of gravel or broken stone 6 to 12 inches in depth should be placed inside the foundation and well tamped down. The concrete mixed in the proportions of one part cement, two and a half parts sand and five parts gravel is laid on the gravel base to a depth of about three inches. If coarse unscreened gravel is used, a finishing layer of sand and cement should be added before the base layer has set. It is desirable to have the floor laid with a slope of about 4 inches in 20 feet towards the front of the building. This makes washing the floor easier and prevents to some extent the scratching of the litter towards the rear of the house by the hens as they face the front windows in their search for grain.

Wooden floors are quite extensively used. A single floor of matched lumber may be satisfactory for colony houses where lightness in weight is a consideration but in permanent buildings the ground story wooden floor should be double boarded with tarred paper between. The floor should be high enough from the ground that neither it nor the supporting joists will be subject to constant dampness that will result in decay. There must be ventilation beneath a board floor but the space below the sills should be boarded tightly enough to keep the floor from being cold and draughty. The remaining floors of multi-storied buildings can either be double boarded or of single matched lumber of full one-inch or greater thickness.

Gravel or earth floors are sometimes used but are usually either damp or dusty and even though renewed frequently they are unsanitary at best.

(*d*) *Roofing materials.*—Shingles, roll roofing, sheet metal, and "built-up" roofing are the materials commonly used to surface poultry house roofs. The type of construction and the availability and cost of materials will have a bearing on which is chosen. The built-up type is used for flat roofs, roll roofing for those having either a moderate or steep pitch, and shingles where the pitch of the roof is fairly steep. Strapping can be used instead of a solid roof deck where sheet metal roofing is used.

(*e*) *Windows.*—Glass substitutes can be used in temporary buildings but glass has greater durability for permanent houses. Double glazed sashes which have two thicknesses of glass set a short distance apart are sometimes used in the colder districts.

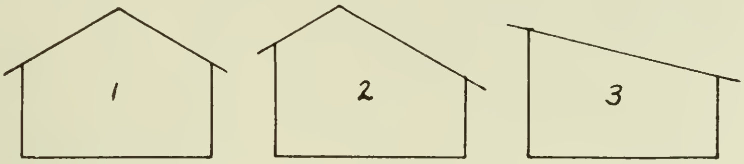
The size and shape of the sashes can be varied considerably without affecting the usefulness of the house. This makes it possible to make use of second-hand sashes which are sometimes available. Double sash windows, such as are commonly used in residences, are used in some areas while sashes with the top part hinged to open inward are used in others.

Factory-made frames can be dispensed with in poultry houses. The sashes can be placed between the studding and held in place by the trimming on the outside and stops nailed to the studding on the inside.

7. Roof types

Of the many roof types which can be considered when building a poultry house, the gable roof seems to meet most Canadian requirements. It creates better housing conditions than most other types, is strong and capable of bearing a heavy weight of snow, easy to build, permits the use of any surfacing material except "built-up" roofing, and is attractive in appearance.

The shed roof is widely used on colony houses and on laying houses in the warmest districts.



ROOF TYPES

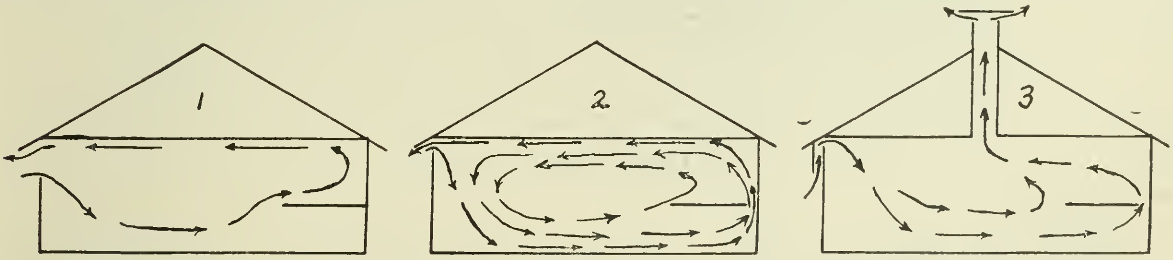
1. Gable. 2. Combination. 3. Shed.

8. Light

The more recent poultry house plans call for one square foot of window space to about 15 square feet of floor space. There is a tendency to use less window space than was formerly recommended. The poultry house should be adequately lighted but more glass than is necessary increases the difficulty of maintaining an even temperature within. In houses that are more than 16 feet in depth, it is advisable to have some windows in the rear of the building to give a more even distribution of light. Where dropping boards are used, cellar sash can be placed near the floor in the rear wall and where pits are used the windows are raised so that the bottoms of the sashes are about 4 feet above the floor. This higher location will prevent cold air striking the backs of the hens directly when they are roosting. Even where rear windows are used, it is customary to have from three-quarters to four-fifths of the window space in the front of the building. Grouping the front windows in the centre of each pen seems to give equally as good lighting as where they are evenly spaced across the front of the house, makes construction easier, and permits a more complete insulation of the front of the building.

9. Ventilation

Ventilation is needed to keep the hens supplied with fresh air and to remove excess moisture from the house. Since hens require more air and give off in breath and droppings more moisture in proportion to their weight than other farm animals, ventilation of poultry houses is a special problem. A ventilating system that works perfectly under all conditions has not been devised.



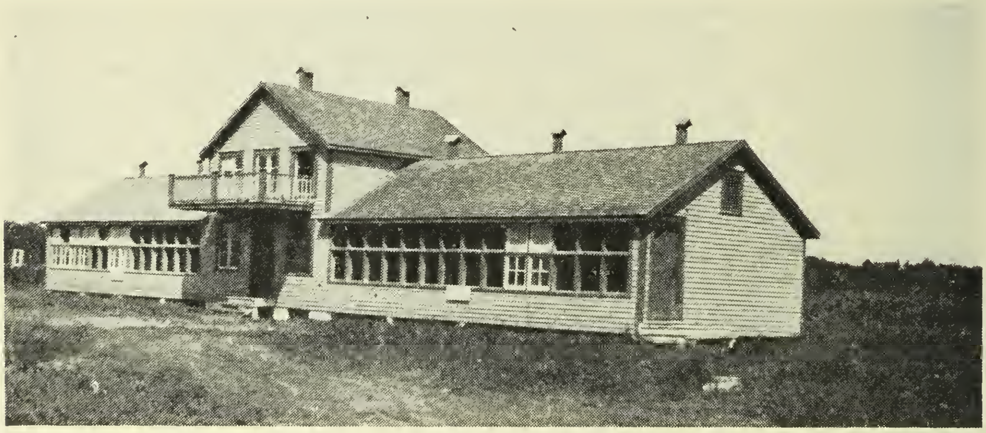
SYSTEMS OF VENTILATION SHOWING AIR MOVEMENTS

1. Open or cotton front house in which the air is too cold to have a great water carrying capacity and there is little recirculation of air.
2. Restricted front house with slot ventilation in which the air is warmed by the body heat of the birds so that there is a recirculation of air and a greater evaporation of moisture.
3. House with flue ventilation. Successful operation of both this and slot ventilation depend on the house being thoroughly insulated.

Three systems of ventilation are being used extensively in Canada. These are the cotton front, slot openings in the front of the house at ceiling height, and the flue systems. Those considering the building of poultry houses should consult local Departments of Agriculture for the latest developments in ventilation.

(*a*) *Cotton front ventilation.*—With this method, the front of the house is tightly boarded to a distance of about 2 feet above the floor. Above this is a row of single sash glass windows extending the greater part of the way across the front of the building. Above the glass windows are cotton screens made by tacking cotton or burlap to home-made frames. Ventilation takes place through the curtains and, for a more rapid movement of air, the curtains are hinged to open inward or arranged to slide vertically. Usually the cotton front house has a slatted ceiling, a straw loft, and openings in the gables which also help in removing excess moisture.

Cotton front houses are naturally cold and often there is condensation of moisture on walls and ceiling. In cold weather this will be in the form of frost and when mild weather follows, the frost melts and the dripping which results makes the litter very damp. Another objection to the cotton front system of ventilation is that the greatest exchange of air takes place during windy weather when it is least needed.

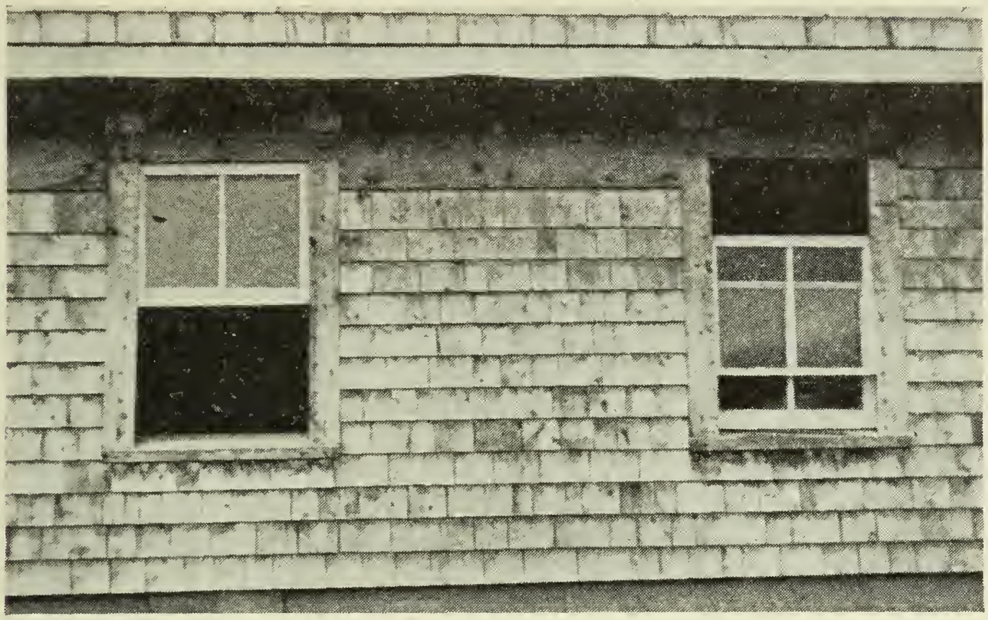


COTTON FRONT VENTILATION

The photograph was taken in the summer when most of both glass windows and cotton screens were removed.

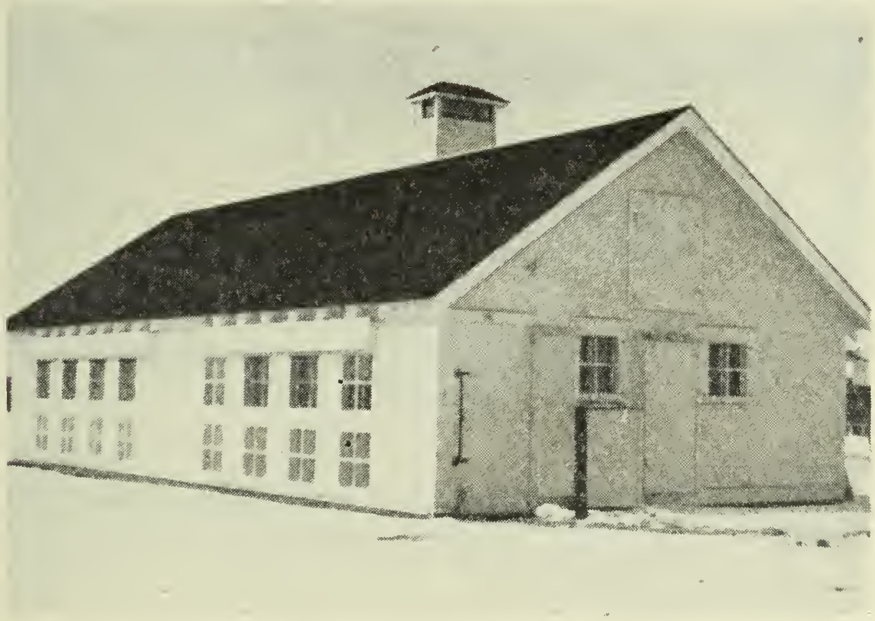
(*b*) *Slot type ventilation.*—Ventilation of this type has been developed largely as a result of investigational work conducted at the Massachusetts State College of Agriculture. To work successfully, it is necessary that the building have a concrete floor and that the walls and ceiling be well insulated. The pens should be divided with solid board partitions and should be no longer than the depth of the building. Each pen has controllable slots or openings at ceiling height and it is through these that fresh air enters and moisture laden air leaves the building.

It is a well-known principle of physics that warm air has a greater water carrying capacity than cold air. The insulation provided in buildings that are to be ventilated by the slot system retains the body heat of the birds and, as a result, the interior temperature of the house is increased so that the air takes up the unwanted moisture. Due to the difference in temperatures outside and within the house, air currents are set up through the slot openings which expel the moisture laden air and bring in fresh air from the outside. Attempts to control all ventilating slots in a building from one central point have not been entirely satisfactory. The ventilating requirements of different pens vary considerably and the best results are secured where the caretaker makes the slot adjustment to suit the needs of each individual pen.



RESTRICTED OR SLOT VENTILATION

A baffle board which is worked manually regulates the movement of air through the slots which are above the windows and at ceiling height. Windows are also an essential part of this system of ventilation.



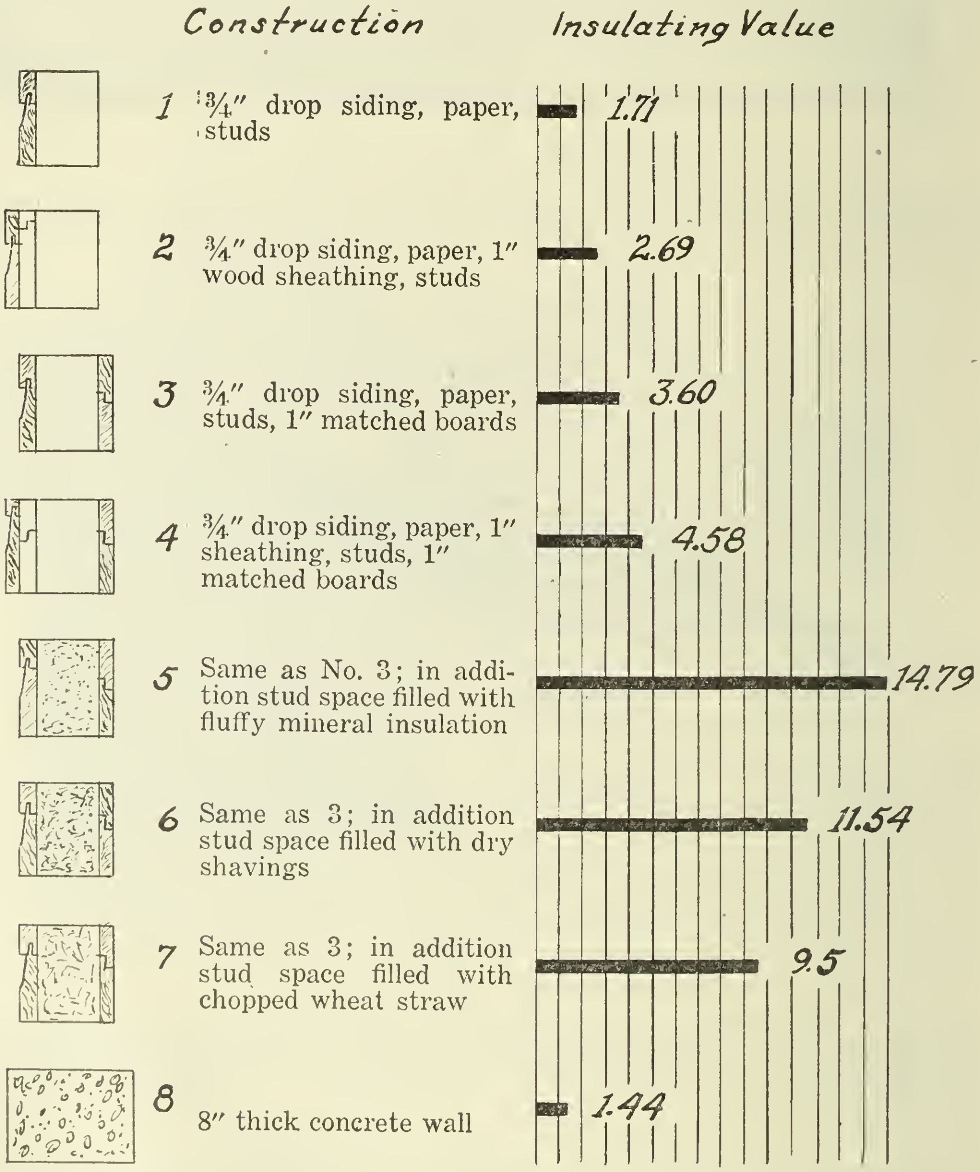
FLUE VENTILATION

The flue in this house has two shafts, one serving each pen. Air inlets are above the windows. The upper sections of the windows tilt inward to permit a greater circulation of air. (Photo, courtesy of Dominion Experimental Station, Swift Current, Sask.)

(*c*) *Flue ventilation.*—This method of ventilation has been more used in the Prairie Provinces than elsewhere and is effective only in insulated houses. Fresh air is admitted through inlets in the front of the building which are fitted with doors to control the inward flow of air. Foul air escapes through a flue running from the ceiling of each pen through the roof. The size of the flues must be varied to suit the sizes of pens in which they are located. One that is 16 by 16 inches in cross section should suffice for a 20- by 20-foot pen. The flues must be insulated from ceiling to roof to prevent the accumulation of frost which will result in dripping with a return to warmer weather. The top of the flue should be fitted with a cap that will not hinder the outward movement of air. Control of the outward movement of air from within the house is made possible by installing a board slide over the ceiling entrance of the flue.

10. Temperature

Little experimental work has been done to prove what is the optimum temperature for laying hens. It is unlikely that it will be attempted because the undertaking would be very expensive and the results impractical in application. It is known that hens will lay almost equally well under a wide range of temperatures and it is believed that anywhere between 50 and 80 degrees F. is reasonably satisfactory. Suitable temperatures for brooding chicks are given in Lesson 6.



INSULATING VALUES OF COMMON CONSTRUCTIONS

(Data from Bulletin 336, "Insulation for Farm Buildings", Agricultural Experiment Station, Fargo, North Dakota, and drawing courtesy of the University of Manitoba.)

Temperatures low enough to cause freezing of the combs will materially reduce the egg production of females and may cause temporary sterility in males. Extreme heat is also harmful and it not uncommon to have hens die in trap nests during very hot weather. Insulation will help in maintaining a more uniform interior temperature and avoiding the extremes of heat and cold. Artificial heating is a possible way of avoiding damage from low temperatures.

11. Artificial heating

Theoretically, the artificial heating of poultry houses should make them more comfortable in cold weather, should keep the interior dry, and make ventilation easier. Some who have used artificial heating are convinced of its value, but others do not share their belief. There is enough uncertainty about its value that its use is not generally recommended.

12. Insulation

The use of insulation seems a more practical method of maintaining a uniform temperature in the poultry house than artificial heating and has been mentioned in Sections 8, 9 and 10 of this lesson. Not only are the extremes of heat and cold avoided by the use of insulation but the building is made draught proof and more easily ventilated.

A practical method of insulating a poultry house is to apply sheathing to the inside of the studding and fill the spaces between the studding so created with dry planer shavings. This treatment should be given all sides of the building and there should be a five- or six-inch layer of shavings over the ceiling. In multi-storied houses the insulation is needed over the ceiling of the top floor only. The shavings should be dry when used and the walls so built that they will remain dry. They should be firmly packed so that there will be a minimum amount of settling. If 2 pounds of hydrated lime are added to 100 pounds of shavings it will have considerable value in repelling rats.

LESSON 4

POULTRY BUILDINGS AND EQUIPMENT

Topics for Study

1. Laying houses.
2. Laying house fittings and equipment.
3. Auxiliary housing space.
4. Colony houses.
5. Range shelters.
6. Laying shelters.
7. Breeding houses.
8. Remodelling.
9. Yards.

Building requirements vary but, in general, the person who raises chicks and keeps a flock of 100 or more laying hens will need three types of buildings, viz., laying house, colony house, and range shelter. The size of the laying house will, of course, depend on the number of hens kept. Where chicks of mixed sex are raised the brooder house and range shelter requirements will be twice as great as where pullets only are raised. The object of this lesson is to discuss the houses and equipment ordinarily needed by poultrymen as well as those of a more specialized nature.

1. Laying houses

Because of the permanent nature of poultry houses and their cost, changes in construction take place relatively slowly. Nevertheless, great changes have taken place in recent years, due in part to the rapid expansion which has taken place in the poultry industry. Among these are the definite trends towards the use of houses of greater width, multi-storied houses, and the use of insulation. Naturally, recommendations regarding details of construction vary in the different provinces and poultrymen are advised to ask for information on poultry houses from their respective Departments of Agriculture.

PRACTICAL LAYING HOUSE FOR 100 HENS

This insulated house is 20 by 20 feet in size and is equipped with flue ventilation. See floor plan, front view and section in Lesson 3. (Photo, courtesy of the University of Manitoba.)

Single-story houses are satisfactory for flocks of any size but the advantages of buildings with two or more stories should not be overlooked where large flocks are to be kept. Foundation and roofing costs are less in proportion to their capacity and, since they are more compact, the work of caring for the flock is more centralized. Naturally the house with two or more stories will require heavier framing and the extra height may be an objection in districts that suffer from tornados.

In Lesson 3 we learned that an allowance of four square feet of floor space should be allowed for each bird of American or English breeds and $3\frac{1}{2}$ square feet for Mediterranean breeds. We also learned that houses that are 20 or more feet in width are more comfortable than those that are narrower. Knowing the amount of floor space needed, the proposed width of the house and the number of birds to be housed, it is simple arithmetic to figure the length of the building required.

Insulated buildings with concrete floor, gable type roof, and with flue or slot ventilation, are preferred for most districts. Pens should be square or nearly so and separated by solid board partitions. If deep litter is to be used there should be at least 7 feet of clear space between floor and ceiling joists. One square foot of window space should be allowed for each 15 square feet of floor space and at least three-quarters of the window space should be in the front of the building.

LARGE CAPACITY LAYING HOUSES

Multi-storied houses with deep pens make the efficient handling of large flocks possible.

(Photo, courtesy of the University of Manitoba.)

The multi-storied building will require heavier framing than a single-story house but, apart from this, the general plans and lay-out are identical. In either case, buildings that are more than sixteen feet in width should have one beam to support the floor or ceiling joists if not more than 24 feet in width and two where the width is greater. These can be of either built-up or solid timbers and should be supported by pillars or posts at 10- or 12-foot intervals. Ordinary concrete floors are not sufficiently strong to carry the weight these pillars bear and a wide-based concrete pier should be built in each location before the floor is laid.

2. Laying house fittings and equipment

The fittings and equipment of the laying house determine, to a considerable degree, whether or not the flock can be cared for easily and economically. Planning for convenient management is time well spent.

(*a*) *Partitions.*—These are used to divide poultry houses into units or pens of convenient size. Where special breeding work is done, pens may house a single mating of 15 birds or less but where commercial egg production is the aim, it is not unusual to plan pens that accommodate up to 300 or 400 layers. Naturally the work of caring for the flock is reduced when the pens are large.

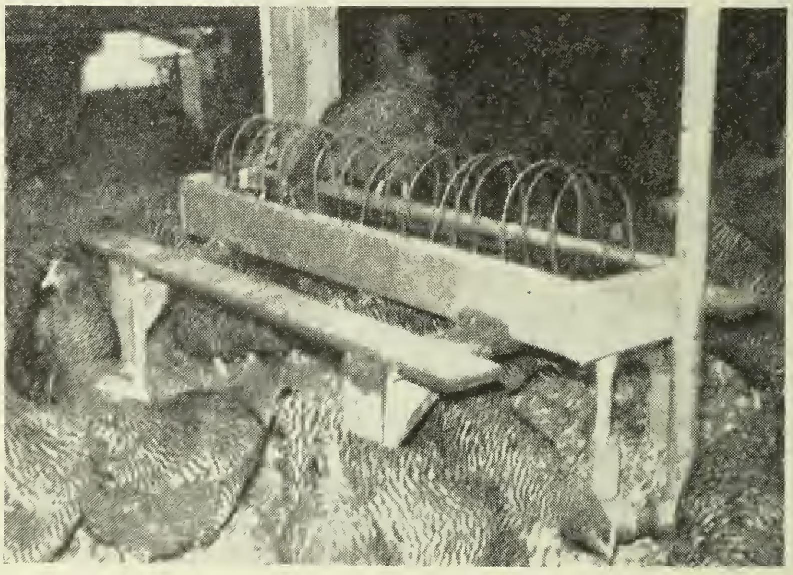
Partitions can be of either wood or wire netting. Where the slot and flue methods of ventilation are used, each pen is a unit so far as ventilation is concerned and the systems work satisfactorily only when there are solid partitions that stop all draughts. In cotton front houses, there should be solid partitions at distances not greater than 40 feet apart to prevent draughts sweeping lengthwise through the house. Where wire is used, the partition should be boarded to a height of about 2½ feet above the floor to prevent fighting between male birds in adjoining pens.

It is a convenience to have the doors between pens hung on double-action spring hinges because the caretaker must often pass from one pen to the next with both hands occupied. The bottoms of such doors should be from 8 to 12 inches above the floor surface so that they will swing clear of the pen litter. With the door so raised, hens are less likely to escape from one pen to the next as the attendant passes through.

(*b*) *Alleyways.*—Alleyways running lengthwise in a building may sometimes be advisable in buildings divided into small pens for special purposes such as brooding, breeding, or experimental work but apart from this they are usually wasted space and provision for them is not recommended.

(*c*) *Stairways.*—Stairs in multi-storied buildings should be indoors and in a convenient location. They are often located in a central feed room.

(*d*) *Artificial lights.*—Electric lights are a convenience in any poultry building. The careful use of lights will help make a laying flock profitable and it is advisable to keep a bulb of low wattage burning all night in brooder houses so that any wandering chicks can find their way back to the source of heat. Electric current is sometimes used to prevent the freezing of water in drinking founts.



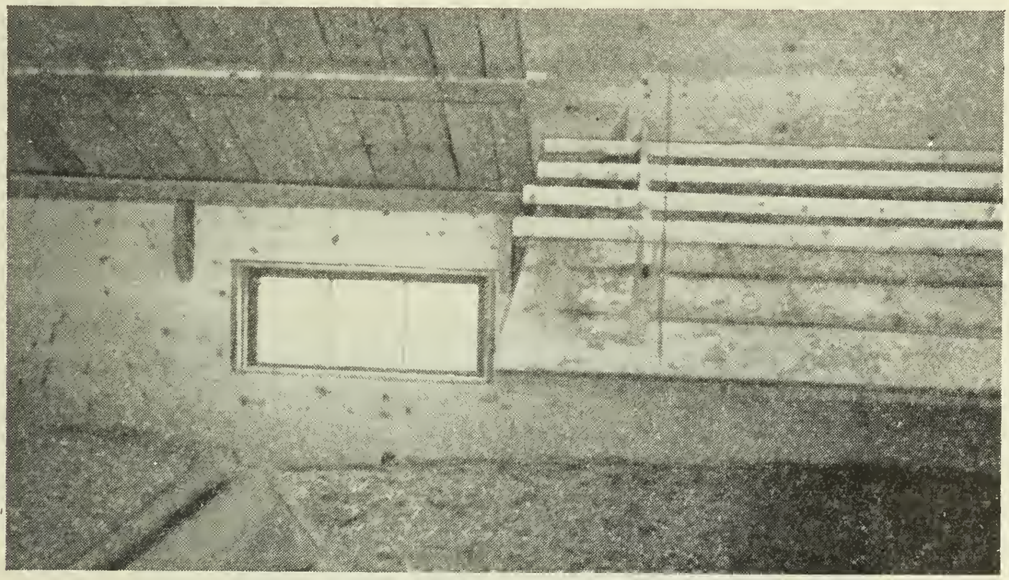
AN EFFICIENT WATER SUPPLY IS ESSENTIAL

In this home-made trough, the water-level is maintained by means of a float shut-off. The attached drain pipe makes cleaning easy.

Laying houses should have one 40-watt bulb for each 200 square feet of floor space or major fraction thereof. In houses not more than 24 feet wide, the lights are placed in a single row at distances not greater than 10 feet apart, midway between the roosting quarters and the front of the building. A double row of lights is necessary in wider houses. The most intense light should fall where the birds eat but some light must also reach the roosting quarters to induce the hens to leave them. The lights should be suspended about 6 feet above the floor and the use of aluminium painted reflectors of about 16-inch diameter will improve the floor lighting. An automatic time switch can be used to turn the lights on and off. When the birds are fed in the evening, it is necessary to have a dimming device to induce them to return to the roosts.

(*e*) *Water supply.*—Many kinds of watering devices, ranging from ordinary metal pails to automatic founts are used. The former are satisfactory for small flocks but the latter should be considered for houses of large capacity. The hens should have a continuous supply of water and the founts should be sanitary and of a design that water will not be spilled in the floor litter.

(*f*) *Roosts.*—The roosts are usually placed at the rear of the building because that location is comfortable and partially darkened, both of which appeal to the hens. They may be suspended or supported in various ways and can run either parallel or at right angles to the rear wall of the house. The roosts should be smooth and free from cracks which offer hiding places for mites. From this standpoint scantling is more satisfactory than round poles and 2- by 2, 2- by 3- or 2- by 4-inch material can be used. An allowance of 7 inches of roosting space should be allowed for each bird of lightweight breeds and 9 inches for medium-weight breeds. The roosts should be placed at 12-inch centres for the former and 14-inch centres for the latter with the first roost at least 10 inches from the rear wall.



ROOSTING QUARTERS

At the left, roosts and dropping boards are elevated to show the window in the rear of the house. At the right, fixtures are lowered to their normal position for use.

Where dropping boards are used, the roosts are usually placed between 3 and 4 feet above the floor. Where a dropping pit is employed, the roosts are placed from one to two feet above the floor. When placed at right angles to the rear wall, the roosts are placed level but when placed parallel with the wall they are usually arranged to rise slightly, ladder-fashion from front to rear. With this arrangement, the birds going to roost first seek the highest roost whereas if the roosts are level they often remain on the front roost and debar their pen mates from those farther back.

(*g*) *Dropping boards.*—These are platforms placed beneath the roosts to catch the night droppings of the birds and have a value in promoting sanitary conditions if cleaned regularly. The cleaning can be done most easily if dressed lumber is used in making the dropping boards and if the boards run at right angles to the rear wall so that scraping is done with the grain of the wood. They should be built in sections for easy removal and wire netting should be used to exclude the birds from their droppings.

(*h*) *Dropping pits.*—These are not true pits but are simply boarded-in areas of floor space with wire netting over the top on which the roosts are placed. Whereas dropping boards need daily cleaning, the pits are cleaned only three or four times yearly.

(*i*) *Nests.*—Nests are sometimes placed under the dropping boards where these are installed but more often in single rows or batteries around the side walls of the pens. Three types are in common use, viz., ordinary, community, and trapnests.

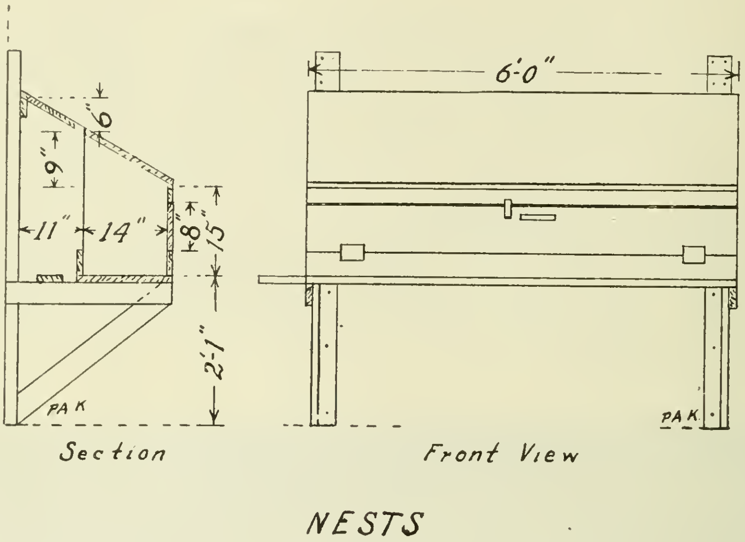
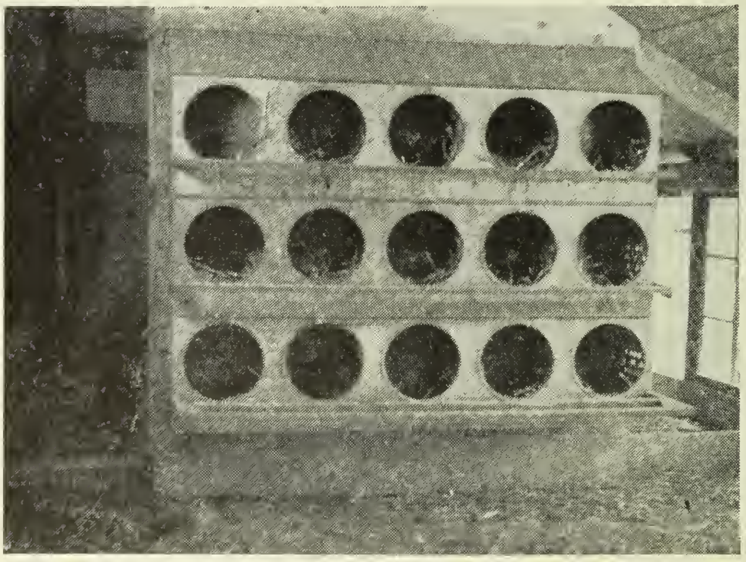


DIAGRAM OF WALL NESTS

(Drawing, courtesy of the University of Manitoba.)

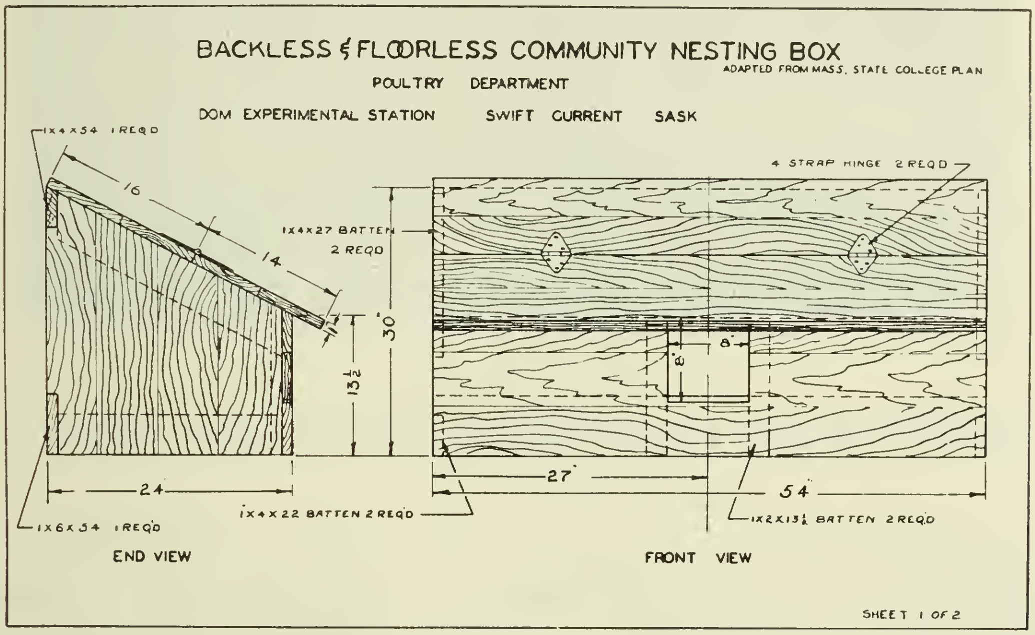


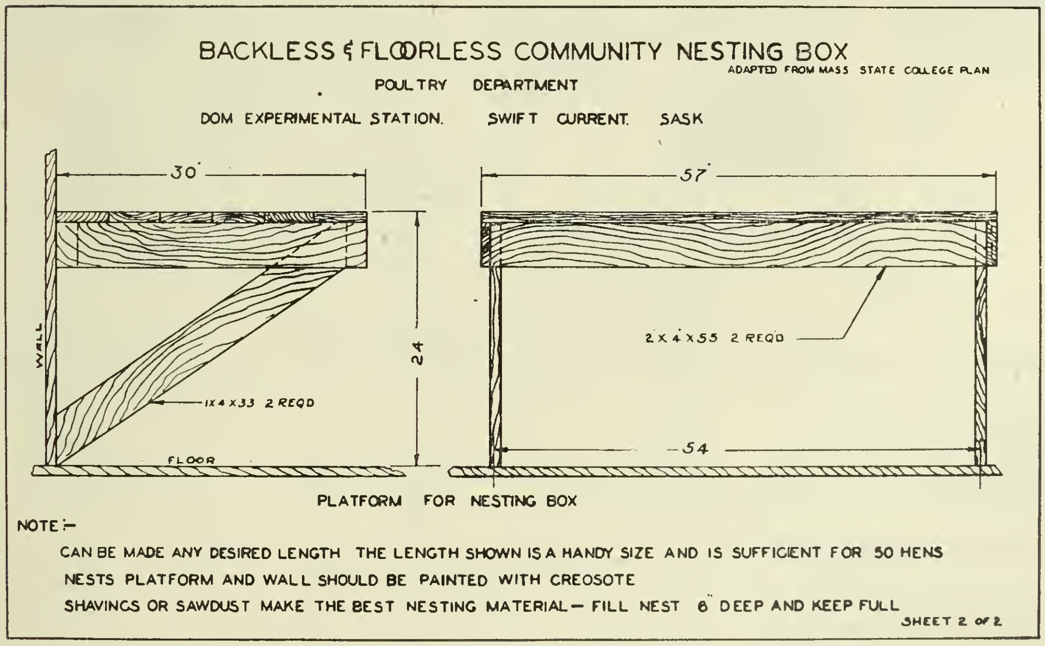
METAL WALL NESTS

These can be converted into trap nests by attaching trap nest fronts or doors.

Ordinary nests are from 12 to 14 inches square, depending on the breed of poultry kept. They are usually made of one-inch boards but metal nests are available and are perhaps more convenient and sanitary. Hens like secluded nests and the egg eating habit is less likely to start where they are used. It is usual to have them arranged so that the hens enter from the rear and the hinged front door is only opened when the caretaker gathers the eggs.

Community nests are more like a coop within the poultry house and are not sub-divided into individual compartments. The entire floor space is covered with nesting material and it is claimed for this type that it eliminates competition for special space and the consequent soiling and breaking of eggs. The size and shape of community nests can be varied but the total floor area may be somewhat less than the combined area of ordinary nests required for a pen of the same size.


BACKLESS & FLOORLESS COMMUNITY NESTING BOX
ADAPTED FROM MASS. STATE COLLEGE PLAN
POULTRY DEPARTMENT
DOM EXPERIMENTAL STATION SWIFT CURRENT SASK
1X4X54 1 REQ'D
16
14
1X4X27 BATTEN 2 REQ'D
1
13½
30"
4 STRAP HINGE 2 REQ'D
8"
8"
24
27"
54"
1X6X54 1 REQ'D
1X4X22 BATTEN 2 REQ'D
1X2X13½ BATTEN 2 REQ'D
END VIEW
FRONT VIEW
SHEET 1 OF 2


BACKLESS & FLOORLESS COMMUNITY NESTING BOX
ADAPTED FROM MASS STATE COLLEGE PLAN
POULTRY DEPARTMENT
DOM EXPERIMENTAL STATION. SWIFT CURRENT. SASK
30"
57"
WALL
24
1X4X33 2 REQ'D
2X4X55 2 REQ'D
54
FLOOR
PLATFORM FOR NESTING BOX
SHEET 2 OF 2

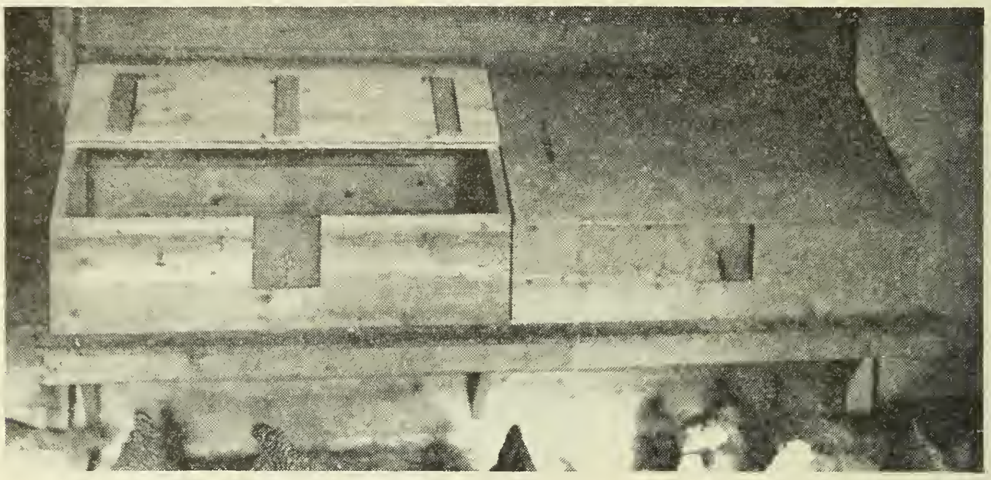
NOTE:-

CAN BE MADE ANY DESIRED LENGTH THE LENGTH SHOWN IS A HANDY SIZE AND IS SUFFICIENT FOR 50 HENS
NESTS PLATFORM AND WALL SHOULD BE PAINTED WITH CREOSOTE
SHAVINGS OR SAWDUST MAKE THE BEST NESTING MATERIAL — FILL NEST 6" DEEP AND KEEP FULL

DIAGRAMS FOR COMMUNITY NESTS

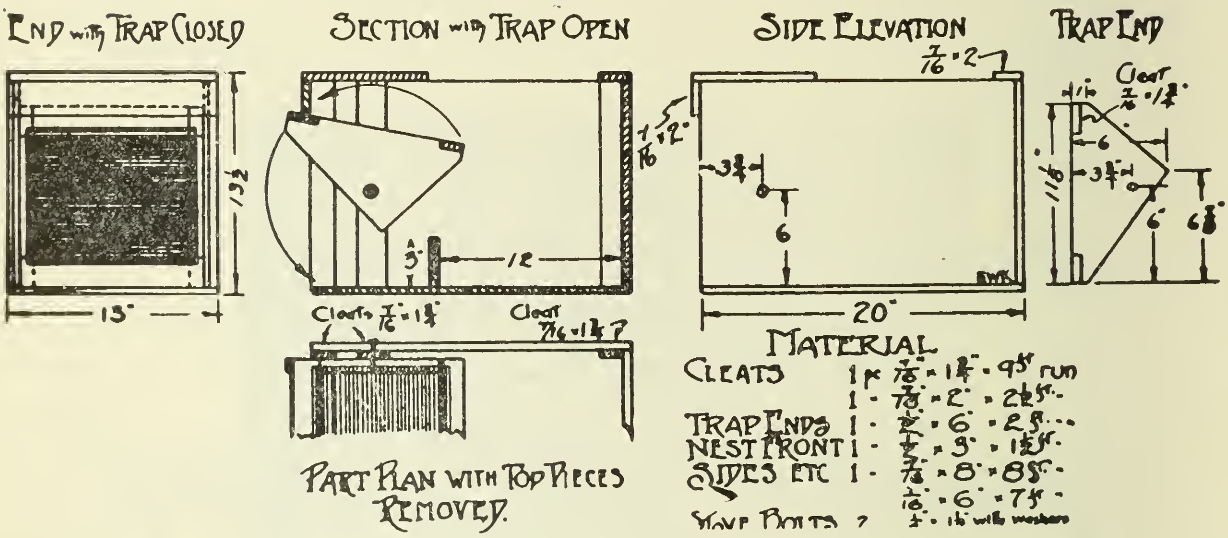
(Drawings, courtesy of Dominion Experimental Station, Swift Current, Sask.)

Trapnests are used where individual egg records of hens are wanted. Each nest has a door which closes automatically as the hen enters and thus imprisons her until she is released by the attendant. Trapnests can be either home-made or factory made.



COMMUNITY NESTS

Built after the plans given in the previous illustration. (Photo, courtesy of Dominion Experiment Station, Swift Current, Sask.)


END WITH TRAP CLOSED
13½
13"
SECTION WITH TRAP OPEN
12
Cleats 7/16 × 1⅛
Cleat 7/16 × 1⅛
PART PLAN WITH TOP PIECES REMOVED
SIDE ELEVATION
7/16 × 2
7/16 × 2
3½
6
20"
TRAP END
Cleat 7/16 × 1⅛
6
3½
11⅛
6"
6⅜"
MATERIAL
CLEATS 1 pc 7/16 × 1⅛ × 95" run
1 - 7/16 × 2" × 26" -
TRAP ENDS 1 - 7/16 × 6 × 28 -
NEST FRONT 1 - 7/16 × 9" × 16" -
SIDES ETC 1 - 7/16 × 8" × 85" -
7/16 × 6" × 75" -
STOVE BOLTS 2 ¼ × 1½ with washers

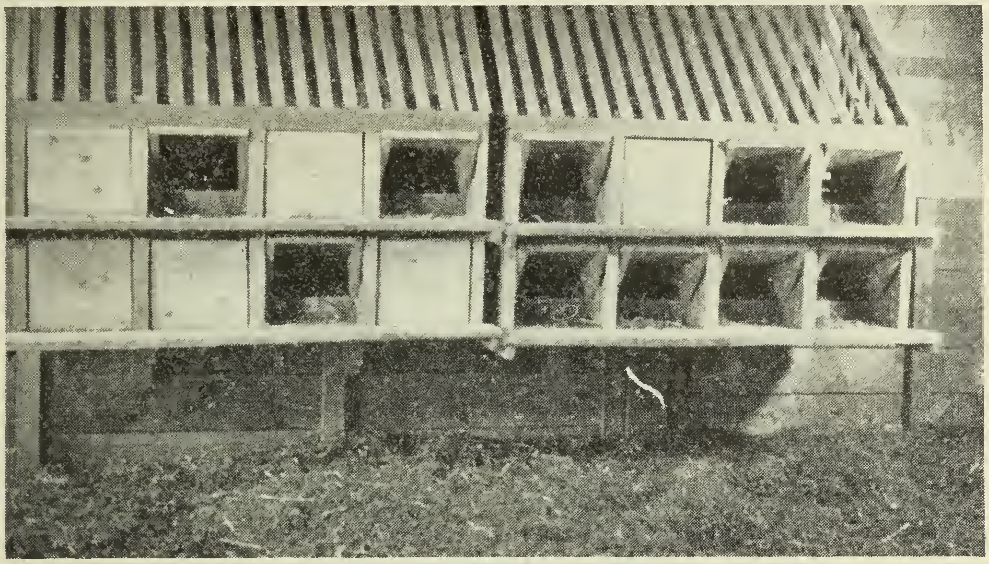
DIAGRAMS FOR TRAP NEST

(Drawing, courtesy of Department of Public Relations, Ontario Agricultural College.)

A common rule for estimating nest requirements is to provide one trapnest for each 4 hens or one ordinary nest for each 6 hens in the flock.

(*j*) *Laying cages.*—With this method of housing laying hens, each bird is kept in an individual wire cage and the cages are joined together in batteries. The birds stand or sit on wire floors which have enough slope that eggs when laid roll to the front and out of reach of the hen. The droppings pass through the floor and are collected on pans or belts. A pen will accommodate more hens in batteries than on the floor and this makes ventilation a greater problem.

Since the hens get no exercise, it is usually necessary to have the battery room heated. These difficulties together with the high cost of equipment should be considered before planning an installation of laying cages.

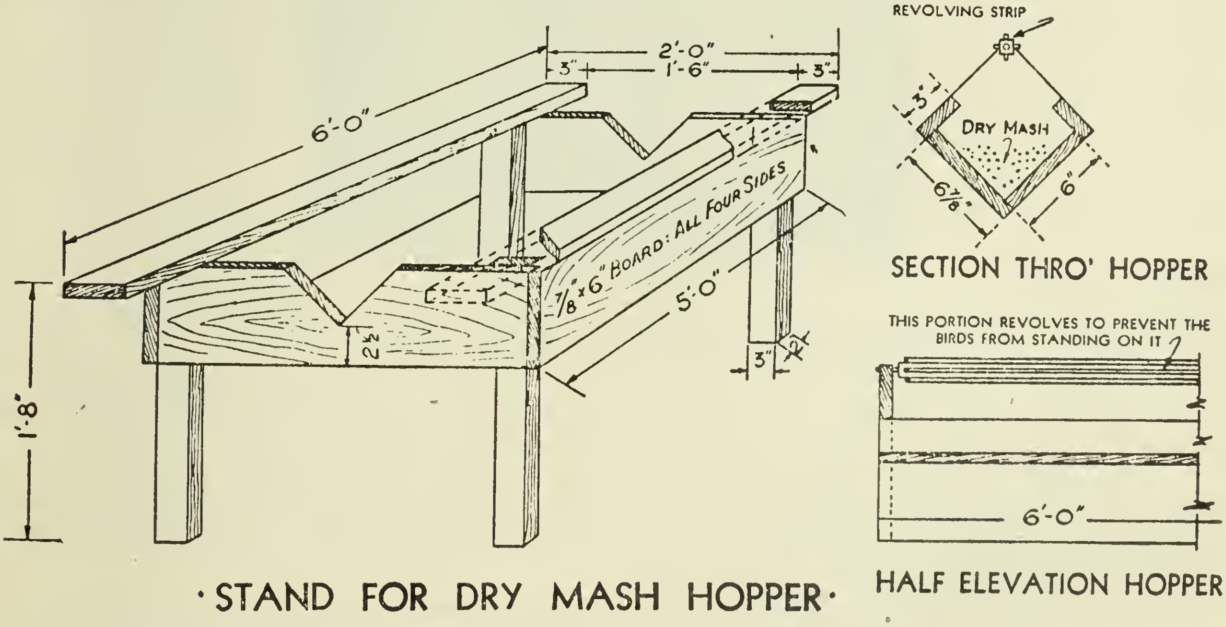


TRAP NESTS

These differ in detail from the plans in the preceding illustration but work on the same principle.

(*k*) *Mash feeders.*—Feeders of the reel type have almost entirely replaced hoppers as dry mash containers. The advantages of the reel type feeders are that they are easily filled, the attendant can see at a glance when the food supply needs replenishing, their shape prevents any clogging and the mash is available to the hens as long as there is any in the feeder. One feeder of this type with trough 5 feet long and with feeding space on both sides will accommodate about 50 birds. A revolving reel above the trough prevents the birds from roosting on the edge and fouling the mash with droppings. Reel feeders are often home-made but several types of metal feeders are available.

(*l*) *Grit and shell feeders.*—Small metal or wooden hoppers should be provided in each pen to hold grit and shell.


6'-0"
2'-0"
3"
1'-6"
3"
7/8"×6" BOARD: ALL FOUR SIDES
5'-0"
2½
1'-8"
3"
2"
REVOLVING STRIP
3"
DRY MASH
6⅞
6"
THIS PORTION REVOLVES TO PREVENT THE BIRDS FROM STANDING ON IT
6'-0"

·STAND FOR DRY MASH HOPPER·

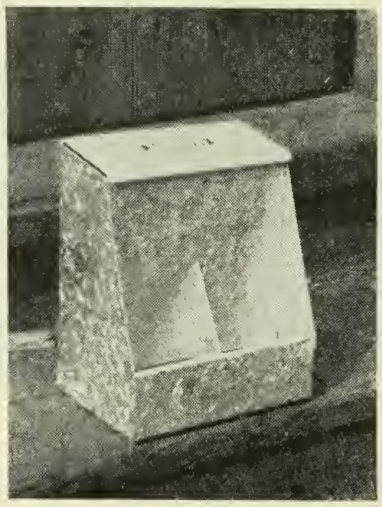
SECTION THRO' HOPPER

HALF ELEVATION HOPPER

DIAGRAMS FOR REEL-TYPE MASH FEEDER

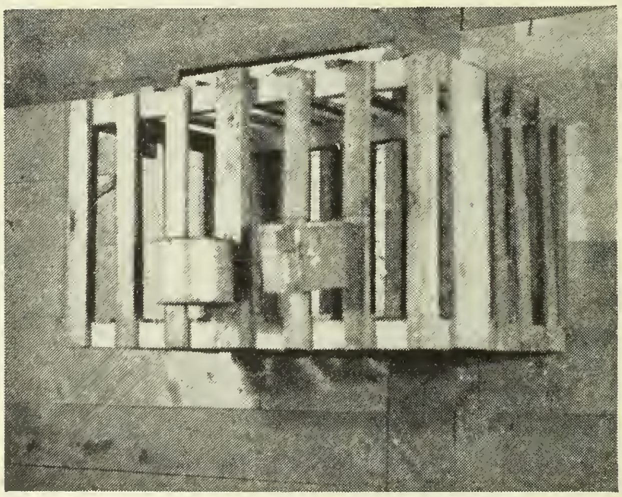
(*m*) *Green feed hoppers.*—Hoppers with sides of 1½- or 2-inch mesh wire netting make suitable containers for cut clover or similar green food.

(*n*) *Broody coop.*—It is a convenience to have a small coop in each pen of a poultry house in which to place hens that develop the broody tendency. Four feet long, 2 feet wide and 18 inches high is a convenient size. The coop can be built of either slats or wire netting and should be suspended from the ceiling or otherwise raised from the floor so that air will circulate freely about it.



GRIT AND SHELL HOPPER

(*o*) *Litter and nesting materials.*—Straw and planer shavings are the products commonly used for nesting material. These and peat moss are used for floor litter.



BROODY COOP

Note attached containers for feed and water.

(*p*) *Elevator.*—A small elevator is of great value in transporting live birds, litter, feed, and eggs in large multi-storied houses.

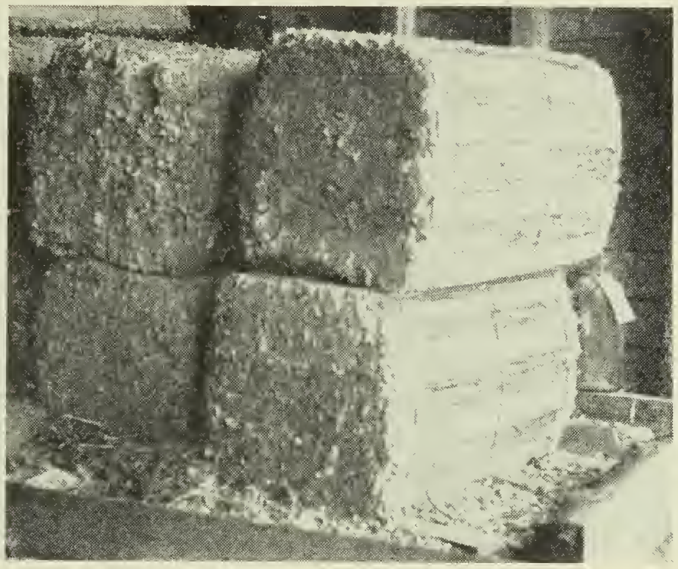
(*q*) *Feed mixer.*—Only large poultry plants where considerable home mixing of feeds is done require feed mixers. They operate with electric power and mix feeds quickly and thoroughly.

(*r*) *Feed conveyor.*—Feed conveyors which operate with electric motors are useful in large laying houses for transporting feed from one floor to another.

(*s*) *Feed bins.*—Small mouse-proof bins for storing a supply of grain and mash in each pen will often save time and energy in caring for the flock.

(*t*) *Feed and litter carriers.*—Feed and litter carriers which operate on a track may be necessities in long laying houses.

(*u*) *Egg baskets.*—Wire egg baskets permit the rapid cooling of eggs and are the most satisfactory containers for collecting eggs and holding them until they are placed in cases.



BALED PLANER SHAVINGS

Popular for floor litter and nesting material.

(*v*) *Scales.*—There are several types of scales which a poultryman may find useful. Special types are available for the weighing of eggs and individual birds. Household and platform scales will be required by some poultrymen.

(*w*) *Cleaning tools.*—These will vary with the layout and management of the house. A stable shovel, manure fork, floor scraper, dropping-board scraper, and hoe are the cleaning tools most used.

(*x*) *Hose.*—Where a building is provided with water under pressure a length of garden hose will prove very useful when the house is being cleaned.

(*y*) *Spray pump.*—A spray pump that will furnish good pressure is a valuable aid in maintaining sanitary conditions in both laying and brooding houses.

(*z*) *Catching hook or net.*—Each pen should have a wire catching hook or catching net for use in catching individual birds.

(*aa*) *Catching crate.*—A catching crate is needed wherever numbers of birds must be caught and handled. It should have strength without too much weight. The top is slatted, sides are either slatted or covered with fine mesh wire netting, and the bottom is tightly boarded. The ends are movable and a sliding door is placed in the top.

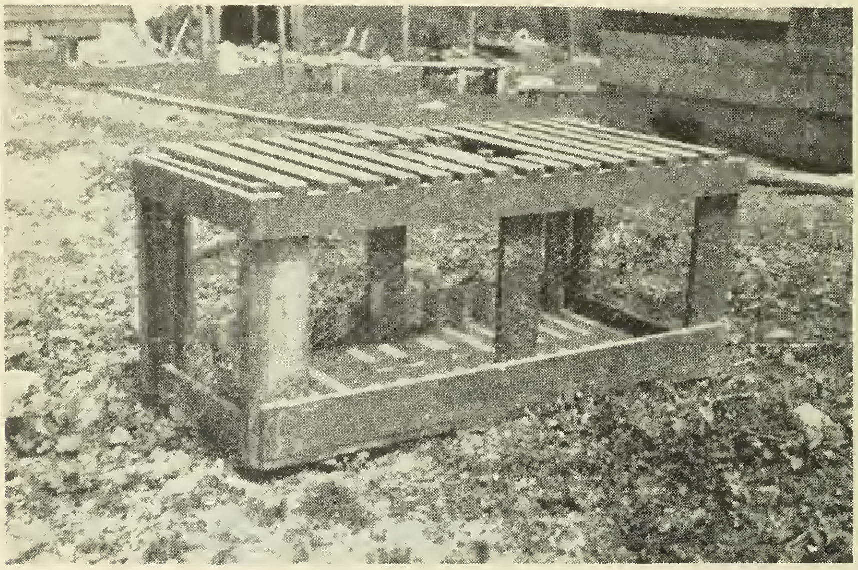
(*bb*) *Incinerator.*—Burning is a desirable method of disposing of dead birds on a poultry plant and an incinerator for this purpose is useful equipment.

(*cc*) *Disposal pit.*—Underground pits with an opening leading to the surface are sometimes used instead of incinerators. A convenient size is 6 feet square and 6 feet deep. The pits are built of poles or planks placed together closely enough to prevent caving of the earth.

(*dd*) *Hot water supply.*—It is desirable that provision should be made somewhere in every large laying house for the heating of water.

3. Auxiliary housing space

In addition to laying quarters there is often a need on large plants for such space as feed room, egg room, killing room, incubator room, root storage, manure shed, workshop, and equipment storage.



CATCHING CRATE

A useful article of equipment on the poultry farm.

(*a*) *Feed room.*—A feed room is a necessity and should be planned and located for convenient use. If sufficient storage space is wanted to permit buying in quantities and at seasons of favourable prices, an allowance of about one-half square foot of floor space for each laying hen should be made.

(*b*) *Egg room.*—Where flocks are small, the eggs are usually kept in the basement or a room of the residence. A specially equipped egg room is desirable for large poultry plants. Extremes of both heat and cold should be prevented. A cellar that is free of objectionable odours is satisfactory in this respect but a well-insulated room on the ground level is preferable from the standpoint of ease in handling the eggs. There should be sufficient space in such a room to store any unexpected accumulation of eggs and, if grading is to be done, there should be a candling bench and grading equipment.

(*c*) *Killing room.*—With the establishment of poultry processing plants quite generally across the country there is less need of killing rooms than formerly. Where one is needed, it should have a concrete floor, running water, and a suitable drainage outlet. The doors and windows should be screened to exclude flies. The room should be equipped with crates or batteries to hold the birds prior to killing, containers for feathers and other offal, a cooling rack, and appliances for killing and plucking.

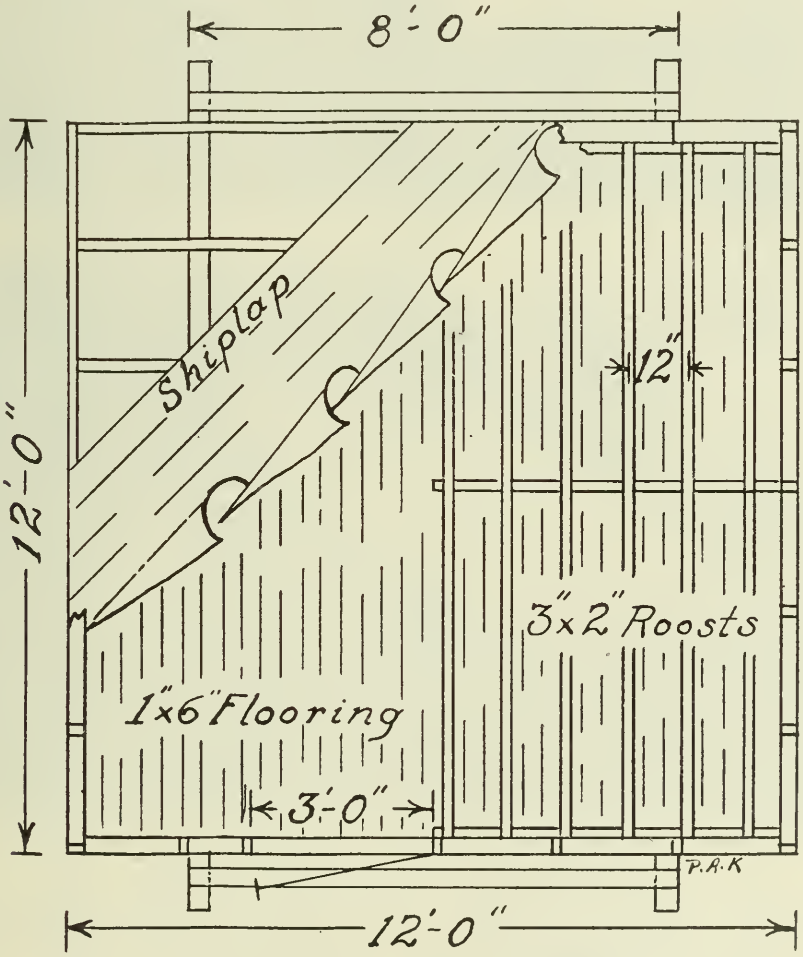
(*d*) *Incubator room.*—A special incubator room is needed only by those who operate mammoth incubators. The incubator room should have insulated walls so that a uniform temperature can be maintained. Preferably, it should have a concrete floor with drainage outlet and a large tank in which the egg trays are washed and disinfected. Hot and cold water should be available. There should be a small dark-room for candling the eggs and tables for use in filling the egg trays and packing chicks. Modern incubators are electrically operated and good lights are needed for candling eggs and sexing chicks so electric wiring is a necessity.

(*e*) *Root storage.*—The use of roots and cabbage for the winter feeding of poultry is less common than formerly but some poultrymen still like to have succulent feed for winter use. The storage place for roots is usually a cellar which is often conveniently located beneath the feed room.

(*f*) *Manure shed.*—It is not advisable to store poultry manure near the laying houses because of its odour and the danger of its being a breeding place for flies. For these reasons, convenience rather than large capacity should be the chief consideration when planning for a manure shed. Usually, only large plants need a manure shed and the most common location is at the end of the laying house.

(*g*) *Workshop.*—A well-equipped workshop is just as essential on a poultry farm as on a general farm since frequent repairs are necessary and a great deal of the equipment can be made at home.

(*h*) *Equipment storage.*—It is desirable that there should be suitable storage space for brooders, chick founts and feeders, range feeders, and other equipment that is used for only a limited period during the year.

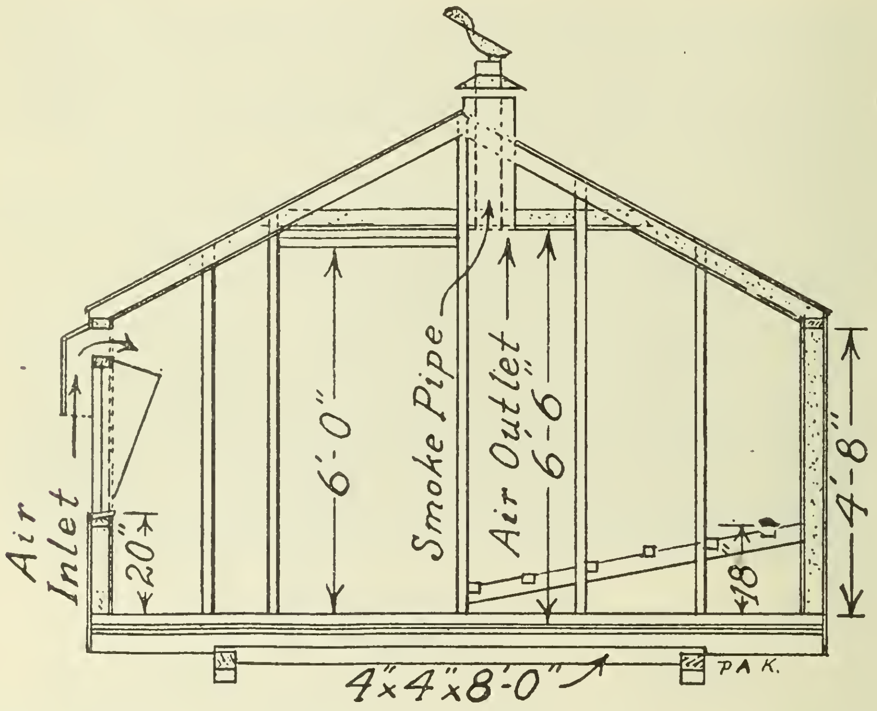


FLOOR PLAN, 12- BY 12-FOOT COLONY HOUSE

(Drawing courtesy of University of Manitoba.)

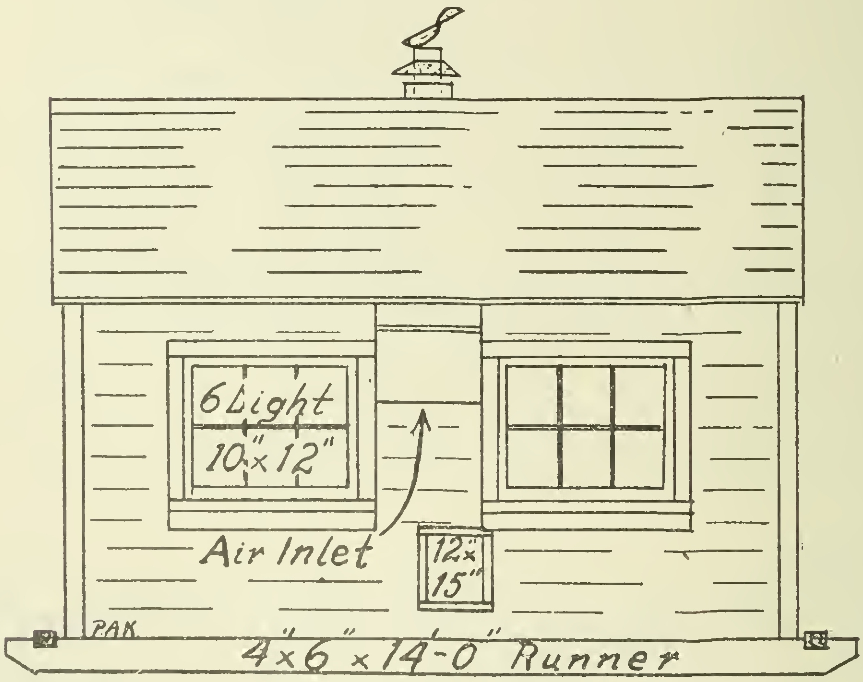
4. Colony houses

A colony house can serve as a brooder house, rearing house, laying house, or breeding house by making a few minor adjustments. These houses are usually built on runners or skids for convenience in moving. Since it is intended that they be portable, the size must be such that they can be easily moved with horses or tractors. Common sizes are 10 by 12 feet, 12 by 12 feet, and 10 by 14 feet. The framing is usually of 2- by 4-inch scantling with two timbers spiked together to form sills and corner posts. Sills and floor joists are spiked to the skids and corners are braced to prevent racking during moving. A single floor of matched lumber is sometimes used because it is light in weight but a double floor with tarred paper between will add to the warmth of the house. The walls should be high enough that the caretaker can work comfortably within and the roof may be of either shed or gable type. The exterior of the building can be of matched siding or of ordinary boards covered with shingles or roll roofing. The insulation of walls and ceiling is not general but is an advantage for the winter brooding of chicks.


Air Inlet
20"
6'-0"
Smoke Pipe
Air Outlet
6'-6"
18"
4'-8"
4"x4"x8'-0"
P.A.K.

END ELEVATION, 12- BY 12-FOOT COLONY HOUSE

(Drawing courtesy of University of Manitoba.)

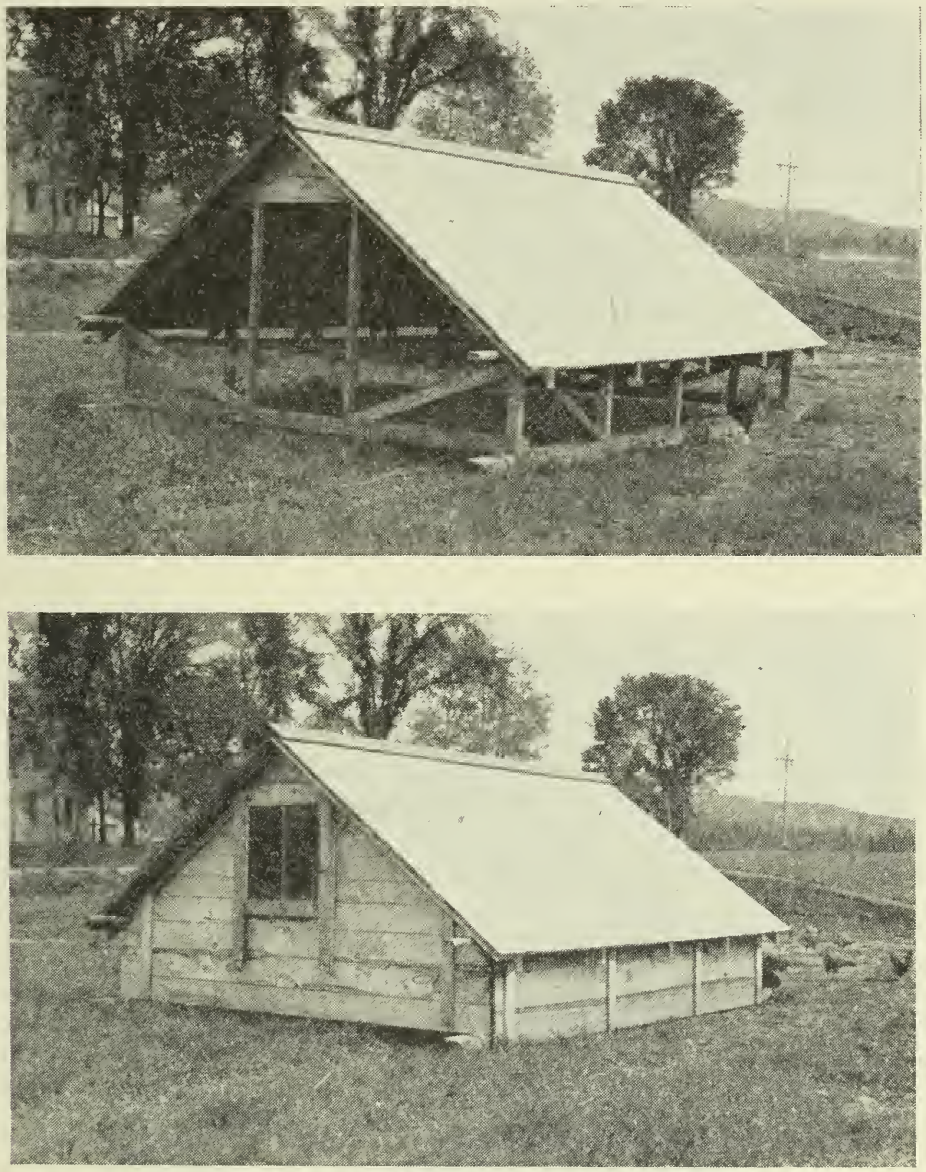

6 Light
10"x12"
Air Inlet
12"x
15"
PAK
4"x6"x14'-0" Runner

FRONT ELEVATION, 12- BY 12-FOOT COLONY HOUSE

(Drawing, courtesy of University of Manitoba.)

Window arrangement is usually similar to that in laying houses and ventilation is provided by cotton screens or windows that open inward at the top. Windows should be removable to make the building comfortable in hot weather. The door is usually placed in one end of the building and should be of matched lumber. The chick door should be of generous size.

Those who intend building colony houses should secure plans from their provincial Departments of Agriculture.



10- BY 12-FOOT RANGE SHELTER

Upper, as used in summer weather. Lower, as used in early spring and cold fall weather. See illustrations of smaller sized range shelters in Lesson 7.

5. Range shelters

The range shelter is used to accommodate the growing chicks during hot weather and is a popular and necessary article of housing equipment. Posts of shelters are ordinarily about 18 inches high and, with a projecting gable roof, the birds are protected from both wind and rain. Sides and ends of shelters are covered completely or nearly so with wire netting. Floors, if used, are of slats or wire netting. Because of the almost unlimited ventilation they provide, almost the entire space within shelters can be used for roosting quarters.

Shelters vary in size from 6 by 8 feet to 10 by 12 feet and accommodate from 75 to 150 birds. They are frequently mounted on skids for easy moving.

When located on the range, the ends of the shelter should face at right angles to the prevailing wind. The season of use can be lengthened by covering the sides with tarred paper, burlap or boards.

6. Laying shelters

Laying shelters are used to house hens during the summer season and are sometimes built so that they can be converted into winter laying houses or brooder houses. They are not widely used in Canada but may prove useful on large poultry farms. A common size for laying shelters is 24 by 24 feet and they are usually built with concrete floors. Posts are about 5 feet high and the gable type of roof is used. The gable ends are enclosed but with controllable openings in each for ventilation. The sides and ends are left open in varying degree, the open space being covered with wire netting as are range shelters. It is probably best in most locations to have one end and half of each side enclosed with boards to give the roosting quarters some protection during high winds.

The shelter provides more comfortable quarters for the yearling hens through the summer months than does a house and because of this they lay later in the fall. If a pasture crop is grown beside the shelter, a readily available source of green feed is provided. The combination of comfortable quarters, sunshine, and green feed puts the hens in good physical condition to stand the strain of a second year's production. Another advantage of using a laying shelter is that it leaves the laying house empty for a period, which gives the poultryman an opportunity to clean and disinfect the pens thoroughly before the pullets are moved in.

7. Breeding houses

Special breeding houses are not needed for general farm flocks but may be an advantage to the specialized breeder who makes many small matings. The requirements of a breeding house are the same as for a laying house except that the building must be divided into many small pens. Partitions and doors should be so constructed and arranged that there is no danger of birds escaping from one pen to another. Yards are more necessary than for laying houses and fences should be such that the birds of different pens cannot intermingle.

REMODELLING

Here one end of the barn has been converted into a three-deck poultry house.

8. Remodelling

On many Canadian farms there are unused barns or other buildings which can be remodelled at comparatively low cost to make satisfactory laying houses. There are also many existing poultry houses that can easily be improved. In many cases the greatest part of the undertaking is to add insulation to make them comfortable, windows to provide light, and openings for ventilation. Many poultry houses are too narrow, some have too high a ceiling, some have inadequate ventilation, and others are draughty.

When remodelling a building, the general recommendations made in Lesson 3 for lighting, ventilation, height of ceiling, size of pens, and other factors should be followed as closely as possible. However, it is not always practical to adhere to the usually accepted rules. For example, it is not possible to change easily the direction that a barn faces and we know from experience that pens facing east or west will give reasonably good housing conditions, although a southern facing is preferred.

9. Yards

Yards are no longer considered necessary as an adjunct to laying houses but are desirable for breeding stock and as pointed out in Lesson 7, range is almost indispensable for the growing stock. It is impossible to keep yards sanitary and produce green feed near poultry houses where large numbers of birds are kept. Unless so kept, they are dangerous from the disease standpoint. With modern methods of feeding it is not necessary to provide yards so that hens will get green feed and sunlight. Where yards are used, they should be so managed that a tender green growth is maintained.

LESSON 5

SOURCES OF CHICKS

Topics for Study

1. Development of the chick.
2. Date of hatching or buying chicks.
3. Selection of hatching eggs.
4. Care of hatching eggs.
5. Natural method of incubation.
6. Artificial method of incubation.
7. Lamp-heated incubators.
8. Chick hatcheries.
9. Consideration in buying chicks.

Hens have a relatively short productive life. In many cases poultrymen renew their entire laying flocks annually and, in any case, at least half the flock must be replaced each year. Previous to 1920 or thereabouts, it was customary for each farmer to produce his own chicks and, when this was done, the percentage hatch, whether by hen or incubator, had a decided influence on the success of his poultry work. Eggs which failed to hatch were a total loss and replacement hatches often produced chicks too late in the season to be profitable. During the second quarter of the century there has been a very rapid change to the production of chicks in mammoth incubators and at present very little home hatching is done.

1. Development of the chick

If a fresh fertile egg is broken into a saucer, a small spot known as the blastodern can be seen on the upper surface of the yolk. This is the point at which the development of the chick begins during incubation. Had the egg been placed in a proper temperature for incubation instead of being broken, a chick would have emerged at the end of 21 days. This transformation from egg to chick in a period of three weeks never fails to attract our interest.

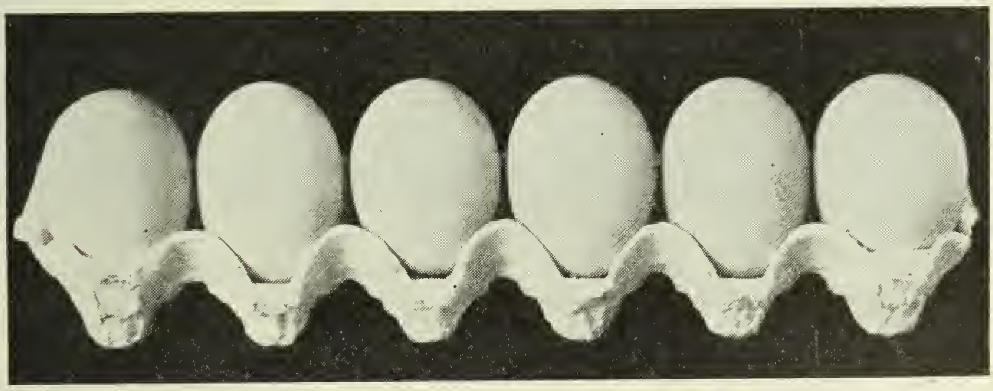
Scientists have carefully studied the development of chicks within the shell. The heart begins to beat on the second day of incubation. The development of bones and beak can be noticed by the fifth day and feather growth can be noticed about the ninth day. During this period the developing chick is known as the embryo. The white and yolk furnish the protein, fats, and minerals required for its nourishment. The shell also furnishes a good part of the calcium needed for the formation of the skeleton. The remainder of the yolk is absorbed into the abdomen through the navel between the seventeenth and twentieth days of incubation. Near hatching time the beak is pushed through the inner shell membrane into the air cell which has become greatly enlarged through elimination of carbon dioxide from respiration of the embyro and evaporation of water. Breathing through the lungs now begins and the chick makes a determined effort to break through the shell with its beak. The breaking of the shell is called "pipping" and continues in a ring around the large end of the egg. When the circle is nearly complete, the chick forces its way out by kicking vigorously against the small end of the shell. The chick presents a very bedraggled appearance as it emerges from the shell because it is wet and weak from exertion. A period of rest follows during which the chick dries off, the down fluffs out, the legs gain strength, and soon it starts in search for food.

2. Date of hatching or buying chicks

With the expansion that has taken place in the poultry business there has been a marked lengthening of the hatching season. The heaviest demand for chicks comes in the month of April but there is continuous hatching from February 1 to June 30 and a few hatcheries operate throughout the year. It is generally advisable to have pullets laying early in the fall when eggs are in greatest demand. With hens of the medium-weight breeds, egg production is seldom general in the flock until they are six months of age. Leghorns mature three or four weeks earlier. Therefore, if it is desired to have a Barred Plymouth Rock flock in general egg production by October 15, the chicks should be hatched by April 15. Early hatched chicks are usually more vigorous, easier to raise and more profitable than late hatched chicks.

3. Selection of hatching eggs

Eggs for incubation from the common breeds of poultry should weigh at least two ounces each or 24 ounces to the dozen. Extremely large eggs, which may be double-yolked, should be discarded as well as those which have pronounced ridges on the shell or signs of any shell weakness. Birds of the Mediterranean Class breeds, such as Leghorns, lay white shelled eggs and any with tinted shells should be discarded. Likewise the American Class breeds, which normally lay eggs with brown or tinted shells, any which are white should be discarded. It has been proved that shape, size, colour, and quality of eggs are characters which are inherited to a considerable degree, so a selection for the ideal in these points is recommended.



CAREFULLY SELECTED EGGS

A requirement for successful incubation. (Photo, courtesy Ontario Agricultural College.)

4. Care of hatching eggs

Eggs are most valuable for hatching purposes when newly laid. Good hatchability may be expected when they are held for periods up to 7 days before incubation begins, but their value decreases very rapidly after that time. Some holding of eggs that are being saved for incubation is always necessary and during this period they should be kept in a cool, well-ventilated room where the temperature is between 40 and 60 degrees F. The eggs may be kept in ordinary egg cases which are turned from one side to another daily. This turning will prevent the yolk from rising and bringing the germ in contact with the shell thus causing its death. Eggs should be gathered frequently to prevent their being soiled, chilled or overheated. Soiled eggs should not be washed and if very dirty they should not be used for incubation. If slightly soiled they may be cleaned with steel wool.

5. Natural method of incubation

Broodiness is the natural maternal tendency for hens to remain on the nest and incubate eggs and hens which show this tendency are spoken of as "broody" hens. When eggs are hatched with such hens we speak of the process as "natural incubation". A reliable broody hen will hatch as high a percentage of fertile eggs as a good incubator, but most hens are far from being reliable in this respect as broodiness is gradually eliminated as a defect in most breeds. Even if they were reliable, it would be impossible to hatch all the chicks that are required in the modern poultry industry by the natural method. Natural incubation is seldom used today but, where attempted, consideration should be given to the mother hen, the nest, the number of eggs given her, and management during the period of incubation.

(*a*) *Choice of hens.*—Hens of the medium-weight breeds make the best sitters and where a selection is possible, those that are medium in size and quiet in disposition should be chosen.

(*b*) *The nest.*—Sitting hens should be removed from the laying flock and given a roomy nest where they will be protected from unfavourable weather and animal enemies. The bottom of the nest should be rounded so that the eggs will not roll away from the hen and yet flat enough that there is no danger of them piling up on top of one another.

(*c*) *Number of eggs.*—The number of eggs that a bird can incubate at one time is called a "sitting" and with hens will vary from 12 to 20 depending on the weather and the size of the hen.

(*d*) *Management of sitting hens.*—Broodiness in hens is indicated by cessation of egg production, their remaining on the nests, uttering the clucking call peculiar to hens that are caring for chicks. and ruffling of the neck feathers when approached by the caretaker. Broodiness should be well marked, the hen appear satisfied with her surroundings, and show an inclination to remain on the nest before eggs are entrusted to her care.

Several hens should be set at one time where this is possible. At the end of the first week, the eggs can be candled and those which are infertile removed. This will permit some doubling-up of eggs and the hens thus relieved can be given new sittings of eggs or returned to the laying pen.

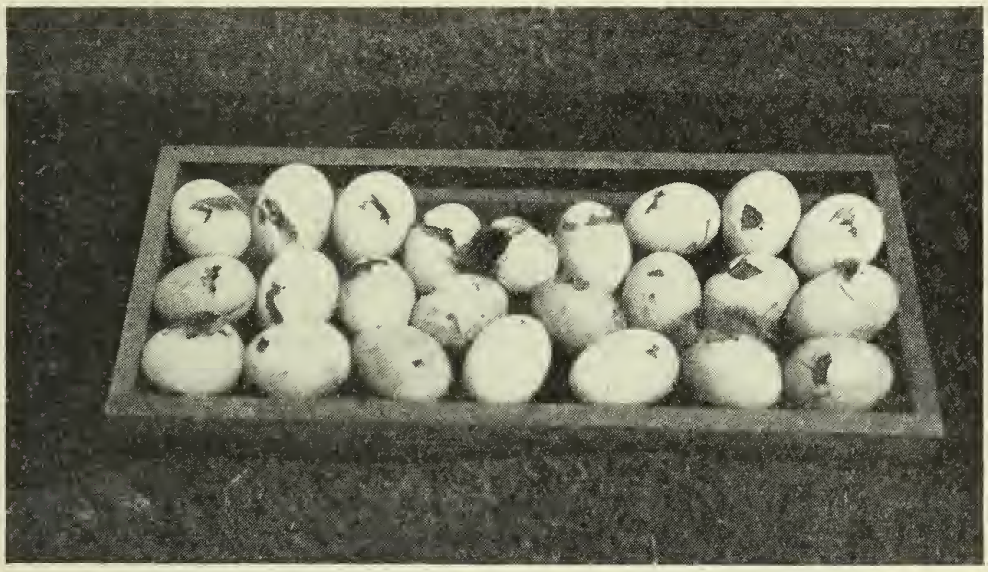
Sitting hens should be given an application of sodium fluoride or other good louse powder before being given their eggs. Blue or mercurial ointment should never be used on sitting hens as the fumes are toxic to the embryos. They are likely to be less disturbed if the eggs are put in the nests after dark. Sitting hens ordinarily leave their nests only once daily during the hatching period. Grain, water, and occasionally, green feed should be placed where they can obtain it when off their nests. Sometimes they show a desire to leave the nests when the first chick has hatched, so it is advisable to confine them to the nests while hatching is in progress. Between 24 and 36 hours after hatching is complete, the hen and chicks can be removed from the nest, placed in a coop and feeding can begin.

6. Artificial method of incubation

It is a well-known fact that artificial incubation was practised by the Chinese and Egyptians thousands of years ago. A fact of historical interest is that on this continent artificial incubation was first practised in Quebec City in 1760. Modern incubators are of fairly recent invention and were first made and used on this continent. Their use has been one of the greatest factors in advancing poultry raising from a hobby or rather insignificant side-line to an industry of national importance.

Poultry raising on its present extensive scale could not be conducted without artificial hatching. Through years of breeding and selecting for high egg production, the maternal or broody tendency has become almost completely lost from Leghorns and is fast disappearing from some other breeds. Even if hens went broody at the desired season it would not be possible to hatch all the chicks required annually by natural means. Where artificial methods of hatching and brooding are followed, the hens are relieved of hatching and mothering chicks and greater egg production results. Flocks which have been reproduced for 25 or more consecutive years by artificial hatching show no evidence of deterioration from this method and it is an accepted belief that artificially hatched chicks are the equal of hen hatched chicks in every respect.

For many years the hatching of eggs on farms by the use of lamp heated incubators was a common and recommended practice. More recently the hatching of chicks in mammoth incubators has become the work of specialists and has almost entirely replaced hatching on general farms.



CHICKS DEAD IN SHELL

The cause of serious loss to hatcherymen. Many die before pipping the shells. Breeding, feeding and management will lessen losses of this nature.

7. Lamp-heated incubators

There are few reasons for recommending the purchase of lamp-heated incubators at the present time and many who own them no longer use them. Some are still in use, however, and this method of getting chicks has the advantage that the owner has full control of the selection, breeding, and management of his flock. This may be a definite advantage in working for flock improvement.

An incubator will operate most satisfactorily in a room which has a temperature of about 70 degrees F. and that has good ventilation without draughts. Any room that meets the requirements stated above, including the cellar, can be used.

For successful incubation it is necessary to control the temperature, humidity, and ventilation of the incubator and since the different makes vary so much in methods of controlling these factors, it is impossible to give general rules that apply to all. A book of operating instructions accompanies each incubator and it should be studied and followed carefully.

8. Chick hatcheries

The operation of hatcheries and the day-old chick business which has arisen because of their operation are so general throughout Canada that we seldom realize in how short a period this development has taken place. Hatcheries have had a phenomenal growth and have entirely changed the poultry industry. Not only have hatcheries grown in numbers and in capacity but the season of operation has increased until in a few cases it is continuous throughout the year.

As the hatchery business developed it became apparent that there should be standards covering the production and sale of chicks. The Dominion Department of Agriculture has set up such standards and they become effective in the respective provinces by proclamation. The provinces may set standards which are higher than those covered by Dominion statute so some variation exists in the standards of different provinces.

The types of hatcheries recognized under the Hatchery Approval Policy of the National Poultry Breeding Program, the control of flocks from which these hatcheries secure their eggs, and the grades of chicks they sell are explained in Lesson 20.

9. Considerations in buying chicks

There is no substitute for quality in day-old chicks. It is sometimes difficult to decide where to buy but consideration of the following points will help in making a choice.

The pullorum disease status of the flock or flocks supplying any hatchery with eggs should be investigated. Loss from pullorum disease has been greatly reduced by the testing of breeding stock for this disease but there is still danger of infection. From the standpoint of freedom of pullorum disease, a Canada Accredited Hatchery (explained in Lesson 20) is the ideal place to buy chicks and second choice is an Approved Hatchery that draws its egg supply entirely from flocks that have been free of pullorum disease in the last test.

STARTED CHICKS

Some avoid the dangers of loss which accompany brooding by buying started chicks which are shipped in boxes like these.

The grades of chicks are explained in Lesson 20 and one should give consideration to the grade he buys. R.O.P. chicks should be bought by pedigree breeders and approved flock owners for foundation breeding stock. The R.O.P.

sired chicks have the advantage of better breeding when stock is wanted for commercial laying flocks. Even between chicks of the same grade there may be a vast difference in breeding and particulars on this point are most easily obtained from the operators of breeder hatcheries. Such operators have it in their power to produce chicks of high quality because they have entire control of the flocks that produce their egg supply.

Other things being equal, it pays to buy chicks that are produced as near home as possible. A long train trip is always accompanied by the dangers of chilling and overheating, as well as delay in feeding and watering the chicks which tends to lower their vitality.

It pays to buy from a hatcheryman whose stock has earned a good reputation. Often it is possible to visit his plant and personally inspect his flock.

Chicks should be bought from a hatcheryman who has a reputation in his own community for honest and upright dealing. Adjustments are sometimes necessary and they are more easily made to the satisfaction of the buyer when he deals with one whose business methods are always ethical.

LESSON 6

BROODING CHICKS

Topics for Study

1. Natural brooding.
2. Artificial brooding.
3. The brooder house.
4. Types of brooders.
5. Selecting a brooder.
6. Brooder house equipment.
7. Preparing for the chicks.
8. Introducing the chicks.
9. Feeding.
10. Management.
11. Getting chicks out of doors.
12. Avoiding unnecessary losses.

The term "brooding" is applied to the care of chicks from the time they are hatched until they are well enough feathered to keep warm without other than their own body heat. When heat is supplied by the mother hen during this period we speak of it as natural brooding and when it is supplied by the use of brooders we call the practice artificial brooding.

HEALTHY CHICKS

A requirement for successful brooding.

1. Natural brooding

Requirements for the natural method of brooding chicks are comparatively few. A barrel or coop that provides about 6 square feet of floor space, enough head room that the mother hen can stand upright, a water-tight roof and provision for ventilation but screened to exclude animal enemies will meet the needs for a shelter. It is advisable to have the roof and floor removable for ease in cleaning.

Hens of the medium-weight breeds are the most satisfactory mothers but are not always reliable. Some will accept chicks of any age or colour, some will accept only those of their own colour while others will mother only chicks of their own hatching. When chicks are given a hen for adoption, they should be placed beside and in front of her. If she calls them and is disposed to hover them, she will probably mother them satisfactorily, but if she picks at them, they should not be trusted to her care. A hen will brood from 15 to 20 chicks, depending on her size and the season of the year.

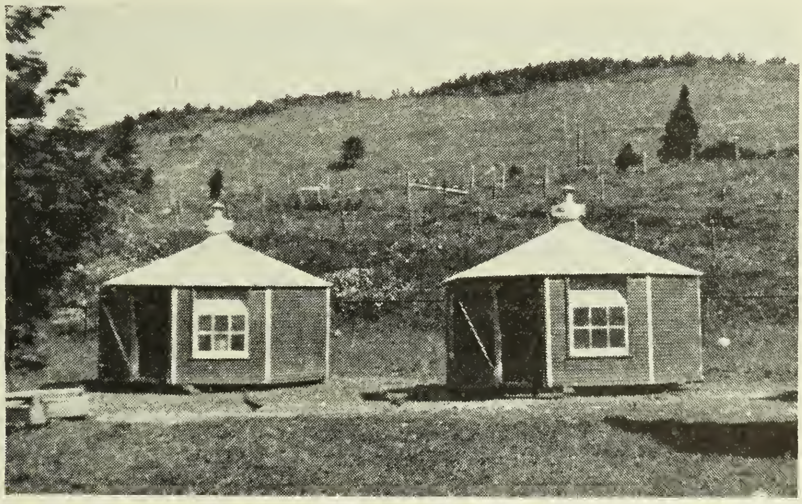
Chicks being brooded by the natural method should be kept on a clean grassy range. It is usually most satisfactory to keep the hen enclosed in the coop and allow the chicks their freedom. For sanitary reasons the location of the coop should be changed occasionally, the floor cleaned regularly and kept covered with clean sand. Feed requirements are less exacting than for artificial brooding because the chicks pick up worms, insects, and green food which provide some of the needed proteins and vitamins. It is usual for a hen to desert her brood and resume egg production when the chicks are from 4 to 6 weeks of age.

2. Artificial brooding

Chickens are now raised in such large numbers that it is neither economical nor possible to brood them by the natural method on commercial farms. With the development of egg laying strains, hens have lost much of their former broody tendency and with Leghorns the maternal instinct has almost entirely disappeared. Artificial brooding simplifies and lowers the cost of raising large numbers of chicks and leaves the hens free to continue producing eggs. Because of these reasons it has become standard practice. It is recognized that some problems accompany artificial brooding that are not met when the natural method is followed. The requirements for brooding are the same as for housing with, in addition, an adequate supply of heat.

3. The brooder house

Four types of brooder houses are being used—colony houses, multiple-unit houses, battery houses, and what we will call, for want of a better term, makeshift houses. Regardless of type, provision should be made for adequate ventilation and ease in cleaning.

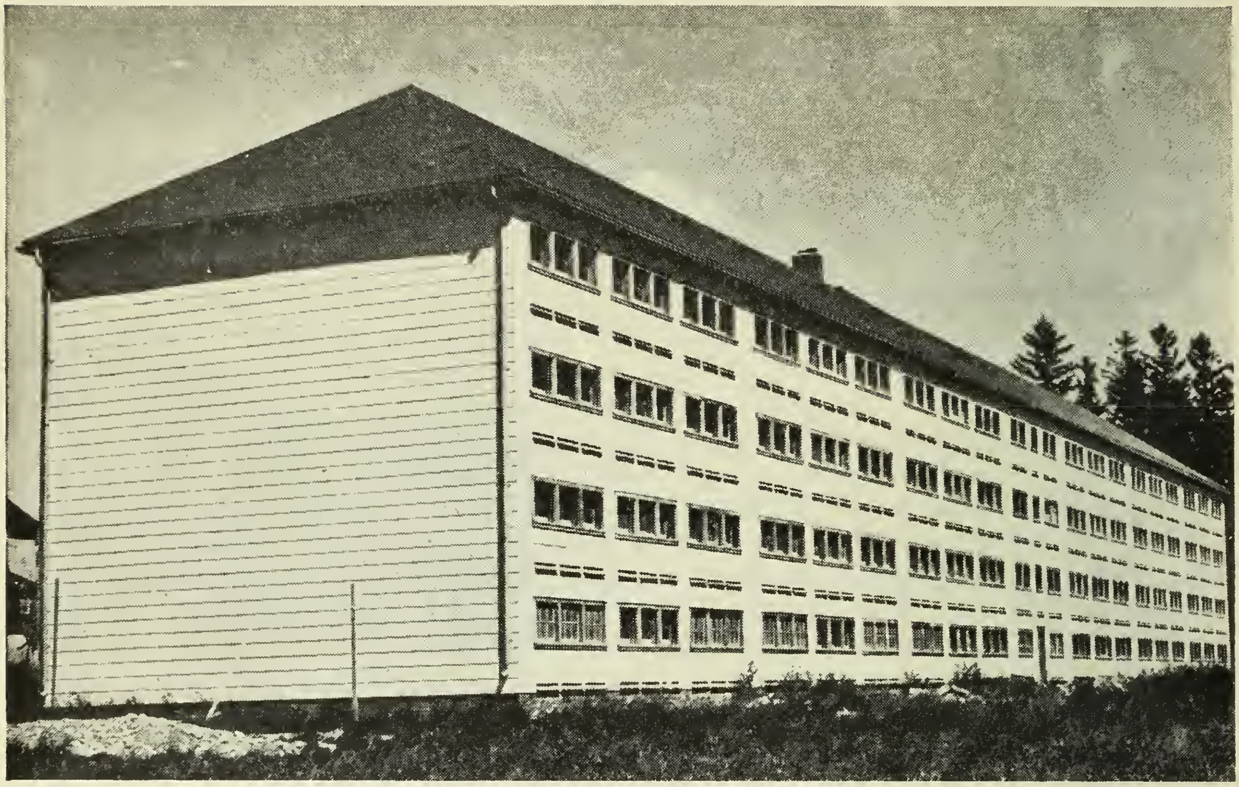


OCTAGONAL COLONY BROODER HOUSES

See plans for easily constructed colony houses in Lesson 4.

(*a*) *Colony house.*—Houses of this type, built on skids for convenience in moving, are most used for brooding chicks on general farms. They are usually 10 by 12 or 12 by 12 feet in size because buildings of this size are easily moved with team or tractor and readily heated with colony brooders that are on the market. Details of construction are given in Lesson 4.

(*b*) *Multiple-unit house.*—Houses of this type are long and are divided into pens, each one of which provides space similar to a colony house. Each pen may be supplied with a brooder or there may be a central heating plant which supplies all the pens. In recent years a few houses of this type have been built on the multi-deck plan but to date there is no generally accepted plan for a multi-deck brooder house.



MULTIPLE-UNIT BROODER HOUSE

This building contains 24 pens each 36 feet square and will accommodate 36,000 birds. It has a central heating plant with electric brooders as auxiliary heating units in each pen. (Photo, courtesy of W. L. Whyte, Seaforth, Ont.)

The use of radiant heating is one of the most recent developments in the large-scale brooding of chicks. With this method there is a central heating plant and hot water circulates through pipes which are embedded in the concrete floor. The claim is made that partitions may be eliminated from houses using this method of heating if the chicks are all of one age. Because of the location of the heating pipes, the floor litter is always dry and there has been practically no loss from coccidiosis during brooding.

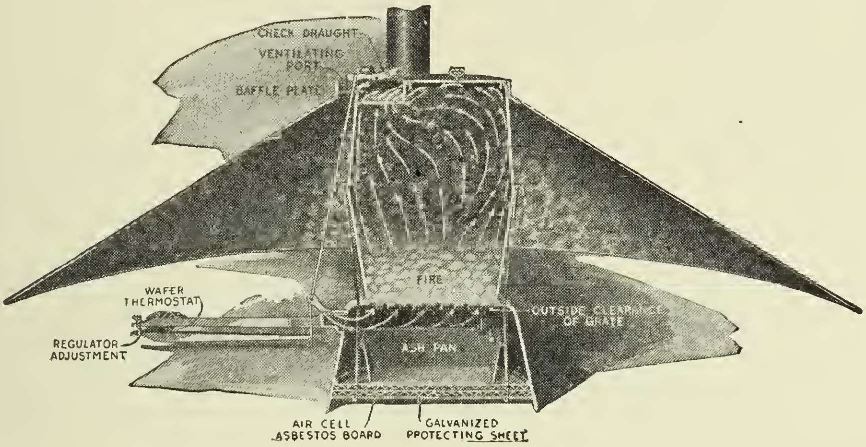
(*c*) *Battery house.*—Battery brooding has not been very generally adopted in Canada. The chicks are carried on several tiers or decks and a much larger number can be kept in a pen than is possible in a colony house where the chicks run on the floor. Because of the increased number of chicks in a pen, ventilation and humidity control are more exacting than in an ordinary brooder house.

(*d*) *Makeshift houses.*—Except where broiler raising is a specialty, brooder houses are used for only a small part of the year. Some enterprising poultrymen have attempted brooding their chicks in houses that in other seasons are used for laying houses or laying shelters. Under some conditions the use of such buildings for brooding chicks is both economical and practical.

4. Types of brooders

There are many types of brooders and a brief description of those in general use follows.

(*a*) *Coal brooders.*—Brooders of this type are probably more used throughout Canada than any other. They are reasonable in price, economical in operation, require comparatively little care and give an abundance of heat. They have the drawback that in warm weather the fire cannot be sufficiently checked without the danger of its going out.



SECTIONAL VIEW OF COAL BURNING BROODER

(Courtesy Buckeye Incubator Company, Springfield, Ohio.)

(*b*) *Oil brooders.*—Oil-burning brooders are usually more expensive than coal brooders. The cost of operation is likely to be greater in cold weather but less in warm weather because of the ease with which the flame can be lowered. Some have a wick while others are wickless and all are easy to operate. The older types which are heated with small lamps have a limited capacity and are satisfactory only for small flocks.

(*c*) *Wood brooders.*—In recent years wood-burning brooders have gained considerable popularity in areas that have a plentiful supply of wood for fuel. They burn less wood and require less care than is generally believed by those who have not used them. The greatest fault seems to be the formation of creosote in the smoke pipe due to incomplete combustion resulting from operation with a small damper opening. Wood-burning brooders are of sheet iron construction and must be well cared for when not in use, to prevent rusting.

(*d*) *Electric brooders.*—Brooders of this type are relatively expensive and the cost of operation is high except in districts that have a very cheap rate for electric current. Electric brooders provide less heat than other types. The temperature is well-maintained under the canopy but little heat escapes into the room. Unless the canopy is well-insulated or the space beneath it especially ventilated, there may be condensation of moisture from the breath of the chicks which will make the floor litter damp. Interruptions in power service are serious where electric brooders are used. They require a minimum amount of attention.

(*e*) *Gas brooders.*—These are low in cost and can be operated with little attention but their use is limited to areas that are supplied with natural gas.

(*f*) *Battery brooders.*—A battery brooder consists of several tiers or decks and each is provided with an electric heating element. In most cases it is necessary to provide some additional heat in the rooms in which they are placed.

(*g*) *Pipe brooder systems.*—With brooders of this type a central heating plant is necessary and they are used only in large-sized plants. Pipe brooder systems with the heating pipes above the floor have been in use for many years without making great gains in popularity. Those with the hot water pipes embedded in the slab of concrete which makes the floor are hardly beyond the experimental stage, but early reports of their use are favourable.

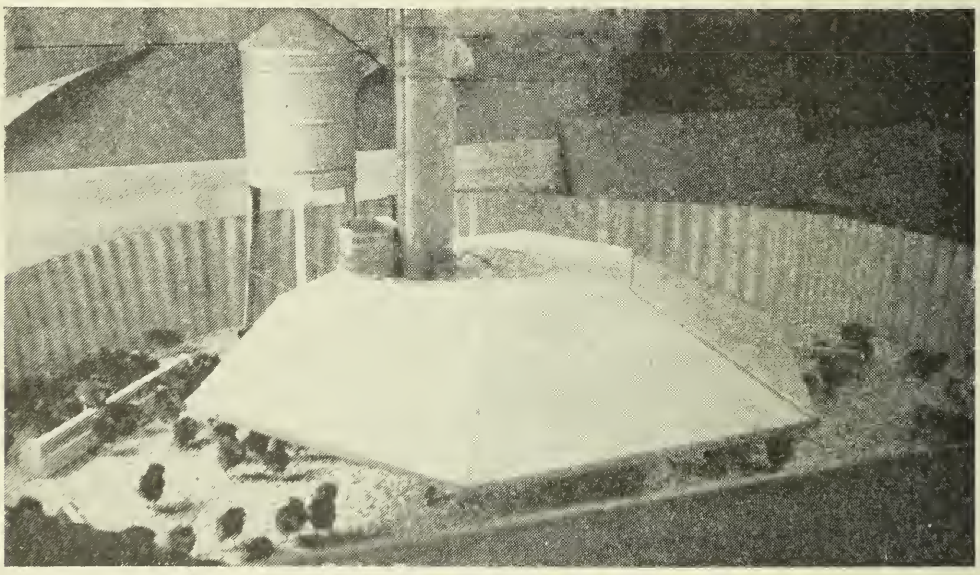
(*h*) *Home-made brooders.*—Ingenious people are often interested in making their own brooders and some of these are quite satisfactory. Some are heated with kerosene lamps, some with electric light bulbs, some with a wood fire, and some with hot water pipes. Generally speaking it is more practical to use the commercially manufactured types.

5. Selecting a brooder

With so many types of brooders on the market, the beginner is likely to be puzzled as to which he should choose. By inquiring into the popularity of types used in his own neighbourhood and by studying the advantages and disadvantages of each, he should be able to make a practical choice.

Pipe brooder systems are used in large plants only. The style with hot water pipes above the floor has not gained in favour and the radiant heat style is almost too new to evaluate. Birds cannot be kept in battery brooders very satisfactorily for the full brooding period so they are not very practical for general farm use, although of great value to hatcherymen as storage and display space for unsold chicks.

Colony type brooders are most satisfactory under general farm conditions. Of these, the gas brooder has a very limited use because of the few poultry producing areas that have a supply of gas. The wood burner is reasonably satisfactory but its use is practical only where there is an abundant supply of wood for fuel. The coal-, oil-, and electrically-heated brooders are more generally used and the choice should depend to some extent on the time of the year the brooding is to be done and on the availability of these fuels. Those who raise chicks on a large scale may find it advisable to use more than one type of brooder.



OIL-BURNING BROODER

Note the metal chick guard.

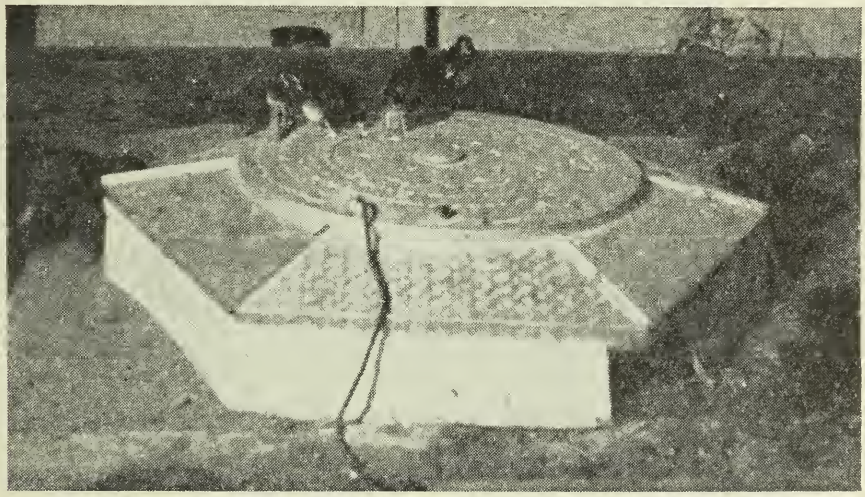
6. Brooder house equipment

Brooder house equipment will vary greatly with the size of the house and the method of brooding. On large plants, a piped water supply, bucket or belt feed conveyors, and litter carriers will contribute towards ease in caring for the flock. Electric lights should be provided where possible. In colony houses, the brooder, a guard fence, roosts towards the end of the brooding season and a sufficient supply of feeders and founts of a size to suit the age of the chicks will meet the usual requirements.

(*a*) *Brooder.*—Brooders are manufactured in several sizes and should be in relation to the size of the house and the number of chicks to be brooded. Manufacturers often overrate the capacities of their brooders. Colony brooders are equipped with a canopy which throws the heat downward towards the floor.

(*b*) *Guard fence.*—It is advisable to have a guard fence of wire netting, sheet metal or other suitable material to place in a circle about the brooder for the first few days to keep the young chicks from wandering too far from the source of heat. In the beginning this guard fence can be 12 to 18 inches from the outer edge of the canopy and the circle widened as the chicks become accustomed to their surroundings and removed entirely at the end of the first week.

(*c*) *Feeders and founts.*—A sufficient supply of sanitary and non-wasting feeders and water founts is necessary. For the first three weeks there should be two one-gallon size water founts and one 4-foot feeder with feeding space on both sides for each 100 chickens. After three weeks, the amount of feeding and drinking space should be doubled. Commercially made metal trough-type feeders with wire guards to exclude the chicks or home-made ones of similar style are satisfactory for the first two weeks. After this time a change should be made to reel-type feeders or hoppers of larger capacity. Metal, glass, or stoneware founts are satisfactory for the water supply. Stoneware founts are most satisfactory for milk or buttermilk. At all times the feeders and founts should be of a size that chicks can eat and drink from them comfortably.



ELECTRIC BROODER

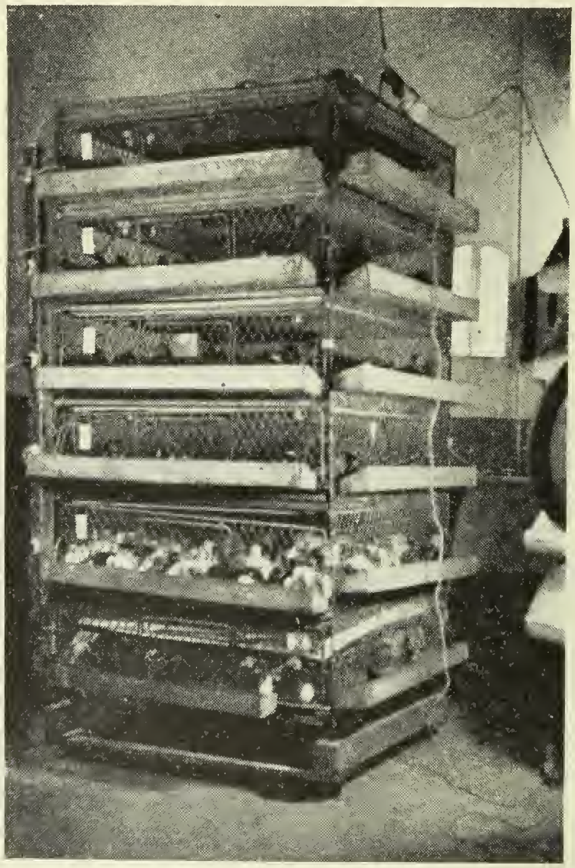
7. Preparing for the chicks

Everything should be in readiness and the brooder tested and proved to be in working order before the chicks arrive. The brooder house should be cleaned and disinfected if it has been used previously. All droppings and litter should be removed by scraping, sweeping, and scrubbing. One can of household lye to 20 gallons of water is an effective solution for scrubbing the interior of the building and this should be followed with an application of a reliable disinfectant.

The colony brooder is usually placed midway between the ends of the building and a little nearer the rear than the front. This location serves the double purpose of providing some seclusion in the area where the chicks sleep and allowing ample space for feeders and waterers in the best lighted part of the building. Water containers should be removed some distance from the brooder so that any litter dampness from spilled water will not be in the area where the chicks sleep at night.

With coal, oil, and wood burning brooders, it is advisable to place some fire-resisting material beneath the heater. This can be a sheet of iron or zinc, a layer of bricks or a shallow box of sand or gravel. Care should also be taken that the smoke pipe does not come in contact with the roof boards. The pipe should be inspected and any defective joint replaced. The draught of coal and wood stoves will be better if there are no elbows in the pipe which should extend at least one foot above the highest part of the roof.

It is advisable to place a layer of fine sand over the entire floor. Some poultrymen use no other litter but others have trouble with the chicks gorging themselves with sand which causes impaction of the digestive system. To prevent this, it is customary to cover the sand with a layer of cut straw, planer shavings, or peat litter. The material used should be free of mustiness.



BATTERY BROODER

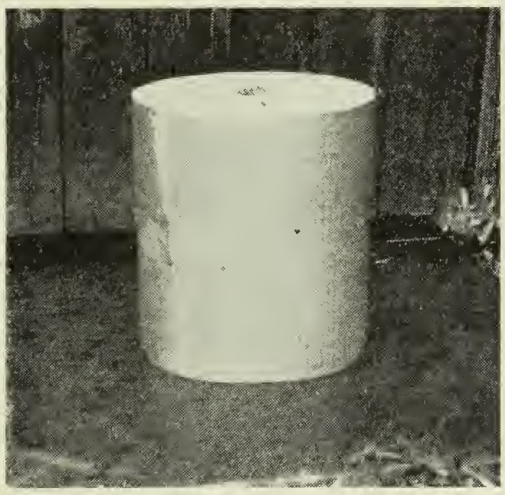
Each deck is heated with a separate electric element.

Many broods of chicks have a tendency to "crowd" into groups and often serious loss results from this habit. Crowding into the corners of the brooder house is so common that it is a wise precaution to block off the corners with boards or fine-mesh wire netting. The material used should remain in place until the flock has learned to roost at night.

The amount of heat given off by brooders is controlled with thermostats. The most common type depends on the expansion and contraction of ether-filled disks or wafers to control the fuel supply or the dampers of the stove. Thermostat wafers often get out of order and it is advisable to keep an extra set on hand. When starting to operate the brooder, the thermostat must be adjusted by the trial and error method so that a proper temperature will be maintained. It is recommended that the brooder be operated at least 24 hours before the chicks arrive.

8. Introducing the chicks

Chicks may be placed with the brooder as soon as received from the hatchery or, if hatched at home, any time after they are 24 hours old. If transferred in daylight, they should be fed and watered immediately. When chicks have been shipped long distances they are very thirsty on arrival and the water should be warmed because drinking heavily of cold water is likely to result in diarrhoea and serious loss. The caretaker must give brooder chicks certain attention that is not required when they have a mother hen to look after them. They must be taught where to look for heat when they are cold and given other elementary training. This "brooder breaking" process requires close attention and considerable patience on the part of the attendant for a day or two but time thus spent usually prevents losses later.



GUARD FENCE

Corrugated paper guard fence. It is used for one brood of chicks only and then destroyed by burning.

CHICK DRINKING FOUNTS

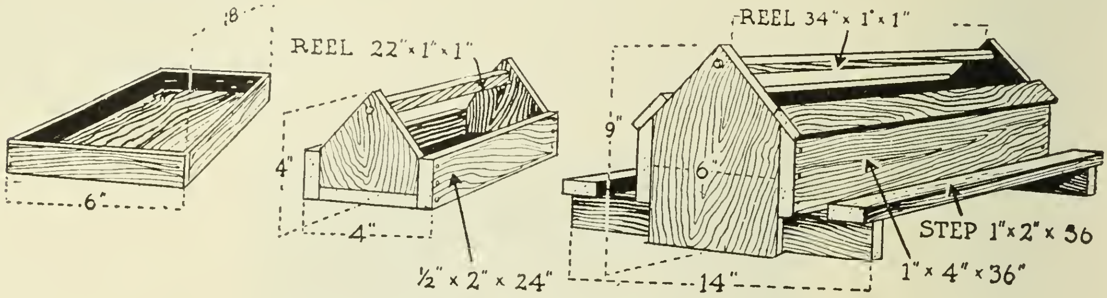
These should be of a size suitable for the age of the chicks.

9. Feeding

The problem of feeding is dealt with in detail in Lessons 8, 9 and 10 but a few of the essentials merit mention here. While there are different methods of feeding chicks, that most commonly used is the feeding of "starting" mash during most or all of the brooding period. Satisfactory starting mashes can be mixed at home when ingredients are available but there are many excellent commercially prepared starters on the market and their use is recommended.

The feed and water containers should be on hand when the chicks are placed with the brooder. Young chicks have a natural tendency to be picking at something and if food is not available, they may pick at the floor litter, their droppings or even at each other. It is customary to place the first few feedings on papers and after chicks have learned to recognize feed they will eat from the feeders. In the beginning about 6 feedings are given daily and as the flock becomes accustomed to eating from the feeders, feed is kept continuously before them.

Finely cracked grains are usually introduced into the diet between the fourth and sixth weeks. A small amount of finely cut green feed is relished and its use is recommended.



CHICK FEEDERS

Feeders, like founts, should be of a size suited to the age of the chicks. (Drawings, courtesy of the University of Manitoba.)

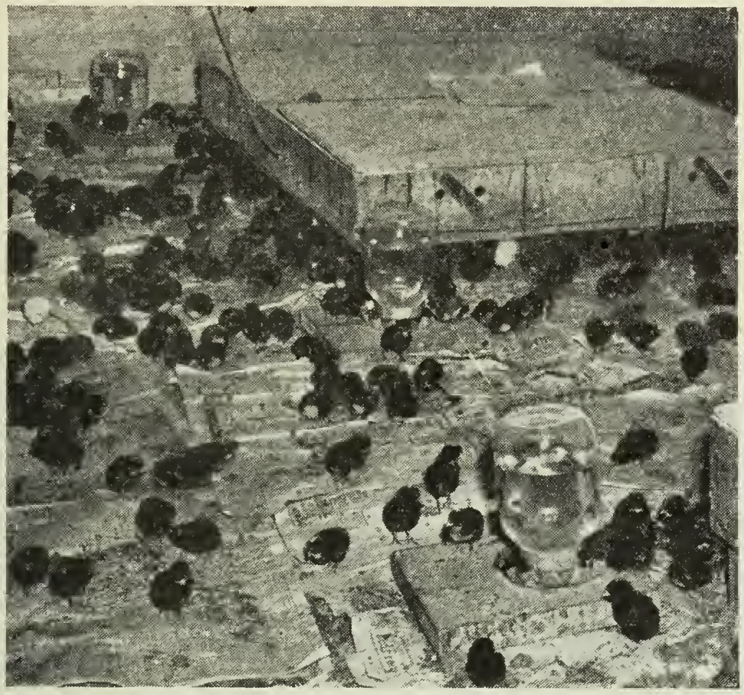
10. Management

Several items of management deserve consideration.

(*a*) *Brooder operation.*—It is impossible to give detailed instructions for the many makes of brooders. Electric and gas burning brooders require very little care after being once regulated. Oil brooders need little attention other than the daily filling of the fuel tank with kerosene or stove oil and the occasional cleaning of valves and burners. They should be visited occasionally in very gusty weather because the flame will sometimes blow out. Coal brooders work most satisfactorily when chestnut size anthracite is used for fuel. They need fuelling twice daily in ordinary weather and sometimes more often when it is very windy. Before coal is added, the grates should be shaken until live coals appear in the ash pan. Wood-burning brooders will operate satisfactorily on rather low grade fuel and ordinarily need refuelling only twice daily. Since the stoves are operated with small damper openings to avoid rapid burning and excessive heat, there is an incomplete combustion of the fuel which results in an accumulation of creosote in the smoke pipes. Insulation of the pipes would probably lessen this but the common practice is to clean out the material either by mechanical means or by deliberately setting it on fire at least once a week.

(*b*) *Temperature requirements.*—Enough heat should be supplied to keep the chicks comfortable at all times. The actual heat requirements of different broods vary somewhat with the vitality of the chicks and the weather at the time they are being brooded. In general, a temperature of from 95 to 100 degrees F. at the outer edge of the canopy and about two inches above the floor should be provided in the beginning. This can be reduced about 5 degrees weekly until 80 degrees is reached after which the reduction should be more gradual. The temperature elsewhere in the brooder house should be about 70 degrees in the beginning and can be lowered to 60 degrees at the close of the brooding period if the weather makes this possible. Healthier chicks are produced when they have an opportunity to exercise in a cooler temperature than that provided under the hover.

At night the chicks will arrange themselves in a circle about the heater at the distance away that provides the most desirable temperature. Experienced poultrymen often depend entirely on the actions of the chicks as a guide to when they are receiving enough heat. Beginners should use a brooder thermometer which can be suspended from the outer edge of the canopy so that the bulb is about two inches above the floor.



COMFORTABLE BROODING CONDITIONS

Note papers on the floor for first feedings, glass water founts and electric brooder. The even distribution of the chicks indicates that they are comfortable. (Photo, courtesy of W. L. Whyte, Seaforth, Ont.)

(*c*) *Litter.*—The floor litter should be replaced often enough to keep the house in a reasonably sanitary condition. Disease organisms thrive under conditions of warmth and moisture so all possible precautions should be taken to keep the litter clean and dry.

(*d*) *Length of brooding period.*—The length of time that chicks need artificial heat varies with the season and with their development. Strains which feather quickly require a shorter period of heat than slow feathering ones. In warm weather it is sometimes possible to discontinue heat after 4 weeks but in cold weather it is needed for from 6 to 8 weeks. Before the heat is entirely discontinued, it may be turned off during warm afternoons. The period without heat can be gradually lengthened until on some warm night the fire is not rekindled. If the chicks settle down quietly, it is probable that no further heat will be required but it is important to keep the brooder in place for a few days because a spell of cold or wet weather may make its use advisable.

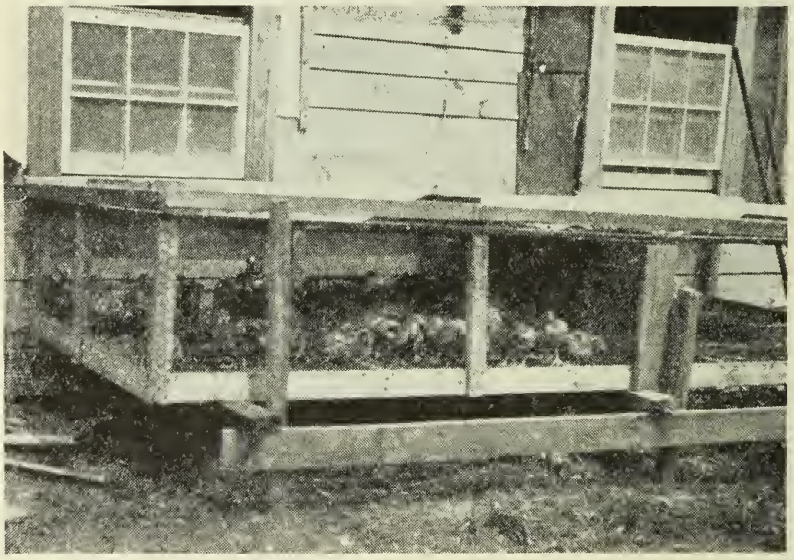
(*e*) *Installing roosts.*—The danger of loss from crowding is not over until the chicks have learned to roost at night and the time that heat is discontinued is a critical one in this regard. Previous to this some low roosts should be installed towards the rear of the brooder house. Chicks will use these more readily if they are fastened to a frame covered with one-inch mesh wire netting. The frame is installed so that its front rests on the floor while the back rests against the rear wall of the house at a height of 12 or 18 inches above the floor. When the chicks are using the roosts freely, the frame, with roosts attached, can be raised to a level position.

(*f*) *Keeping the chicks busy.*—Chicks are less likely to develop bad habits if a program of feeding and management is adopted that keeps them busy throughout the day.

(*g*) *Caretaker's movements.*—The caretaker should move quietly through pens and yards to prevent undue disturbance which can cause panic and result in serious loss from crowding. This danger is greatest among breeds such as Leghorns which have a nervous temperament.

11. Getting the chicks out of doors

After the chicks are a week old they should be given an out-door run if the weather permits. The caretaker will be saved considerable labour if the yard is small at first because the chicks will need some training before they learn to find their way back into the brooder house readily. As conditions warrant, the enclosure can be enlarged or the fence removed if the chicks are to have free range.



SUN PORCH

A useful addition to the brooder house for early spring brooding.

A sun porch with board or hardware cloth floor, board or wire netting sides and wire netting top attached to the brooder house will permit getting the chicks out in the sunshine before it is possible to let them run on the ground. This plan is used extensively in the raising of turkeys.

12. Avoiding unnecessary losses

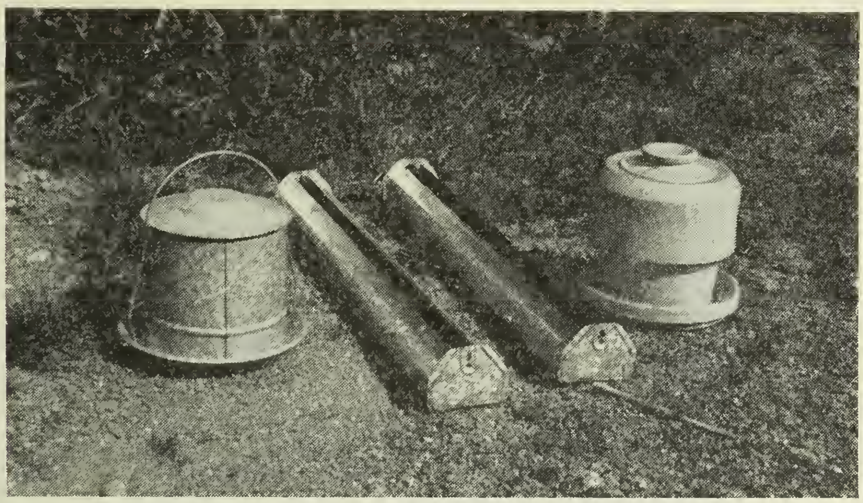
A knowledge of how to avoid the losses that often occur in raising chickens will often save the poultryman money. Common causes of loss during the brooding period are overcrowding the brooder house, too few or too small feed and water containers, too little and too much heat, insufficient ventilation, lack of sanitation, fire, crowding, and cannibalism. Some of these are associated with each other such as crowding caused by too much or too little heat.

(*a*) *Overcrowding.*—Hundreds of chickens fail to thrive each year because they are not given enough room. The allowance of floor space for the first 6 weeks should be one-half square foot for each chick. After 6 weeks this allowance should be doubled. On this basis a 10- by 12-foot colony house will accommodate 240 chicks through the brooding period.

(*b*) *Insufficient feed and water containers.*—This is a more common cause of unthrifty chicks than is generally believed. For each 100 day-old chicks there should be 8 lineal feet of feeding space and two one-gallon water founts. At the end of 3 weeks this allowance should be doubled. This will probably suffice for the brooding period but three or four sizes of feeders are needed during the growing season.

(*c*) *Improper temperature.*—Either too much or too little heat will have a serious effect on growing chicks. They are likely to show diarrhoea, do not feather smoothly and uniformly, and become stunted. Extremes of temperature often start crowding which may result in immediate heavy losses.

(*d*) *Insufficient ventilation.*—Ventilation is needed to supply the chicks with oxygen and to remove the foul air and moisture given off in their breathing. Brooder houses are usually ventilated by lowering windows in the front of the house or by means of cotton curtains. For warm weather brooding it is advisable to have an opening in the rear wall so that a rapid exchange of air is possible. Ventilation should be done in a manner that direct draughts will not fall on the backs of the chicks.



CHICK FOUNTS AND FEEDERS

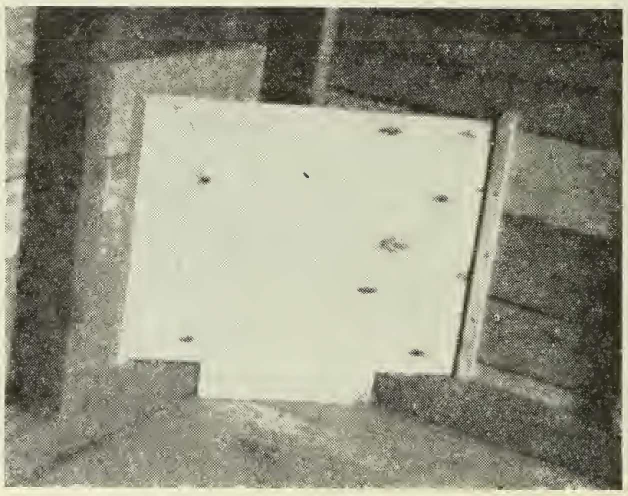
Adequate provision for 100 day-old chicks but insufficient after about three weeks.

(*e*) *Lack of sanitation.*—Disease organisms thrive in filth so it pays the poultryman to follow a program of sanitation in his chick brooding. Sunlight is effective in killing many disease germs and helps prevent rickets in chicks so provision should be made for the entry of direct sunlight. The brooder house should be cleaned and disinfected between different broods of chicks. There should be a system of ventilation and management that will keep the floor litter dry at all times.

(*f*) *Fire.*—The operation of any type of brooder creates a fire hazard and broods of chicks are lost in fires every year. Common-sense precautions that should be taken to avoid fires are mentioned in section 7 of this lesson. Care should also be taken during the removal of ashes from coal and wood burning brooders. Thermostats should always be kept in good working condition so that their failure will not result in too violent a heat.

(*g*) *Crowding.*—The serious losses that can result from crowding have already been mentioned. Chilling, overheating, and sudden frights are three of the most common causes of crowding and each suggests its own means of prevention. Sometimes when sunlight strikes the floor in bright patches, the chicks will crowd together in these areas. Here the underlying cause is likely to be too little heat. Rounding the corners of the brooder house and the early installation of roosts are two precautions that should always be taken.

(*h*) *Cannibalism.*—If this vice becomes a habit it may result in serious loss. Common underlying causes are overcrowding in the brooder house or on the range or an insufficient supply of feed and water containers. Young chicks are inclined to pick at anything bright including the toe nails of fellow members of the flock. If bleeding starts from this or from an injury, the bright red blood attracts the chicks and often leads to cannibalism. It is difficult to check an outbreak and what is an effective remedy in one case may be useless in another. Sometimes the feeding of a more bulky diet or the addition of fresh green feed may help. Darkening the windows, painting them red or the installation of ruby electric light bulbs may be effective in some cases. Pine tar or a paste made from four ounces vaseline, one tablespoonful bitter aloes and enough venetian red to give the mixture a blood colour, applied to parts which have been bleeding may have a repellent value. Prevention is preferable to treatment and first precautions are to avoid overcrowding at all times and provide enough feed and water dishes of the right size for the flock. A complete feed mixture that contains some roughage should be supplied generously.



BLOCKING THE CORNERS

This precaution will reduce losses from crowding.

(*i*) *Brooding together chicks of different ages.*—Both mortality and unthriftiness among the survivors follow the practice of brooding together chicks of different ages. The greater the variation in the ages of the chicks, the greater the danger of loss but it can be serious when the difference in age is only a few days. It may seem convenient to brood together chicks of different ages but the results are always disappointing.

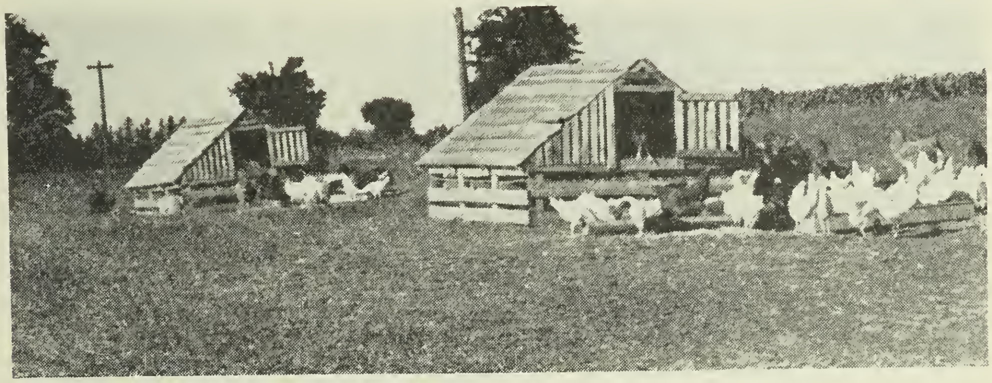
LESSON 7

SUMMER CARE OF THE FLOCK

Topics for Study

1. Separating the sexes.
2. Placing on range.
3. Range shelters.
4. Range maintenance.
5. Rotating the range.
6. Range feeders.
7. Range watering systems.
8. Summer management of growing stock.
9. Estimating mortality.
10. Feed consumption and growth tables.
11. Broiler production.
12. Promoting good habits.
13. Transferring to laying quarters.
14. Maintaining high egg production.
15. Summer management of adult stock.
16. Laying shelters.

It has been said that chicks are usually given more care than they require during their first week and too little throughout the remainder of their lives. There is some truth in this statement and it is certain that many flocks suffer neglect following the brooding season. An effort is made in this lesson to outline the care that both growing chicks and adult stock should have during the summer months.



SMALL RANGE SHELTERS

These 6- by 8-foot range shelters are cheaply constructed and easily moved. (Photo, courtesy of W. L. Whyte, Seaforth, Ont.)

1. Separating the sexes

If the brooder house was filled to capacity in the beginning and mortality is no greater than normal, the building will certainly be overcrowded at the end of the brooding season. It is advisable to relieve the congestion by dividing the flock according to sex because pullets thrive better without the annoyance of the cockerels. The flock should be divided when the birds are between 8 and 12 weeks of age. One sex can remain in the brooder house if it is not to be used immediately for brooding another flock of chicks while the other is transferred to another house or a range shelter.

2. Placing on range

It is possible to raise chicks to maturity in confinement but it does not seem to be necessary or practical to do it under most Canadian conditions. It is therefore recommended that the chicks be placed on range as soon as weather permits after the brooding season has ended. Chicks raised on range will be hardier, there will be less mortality, and if the range carries a desirable growth of green forage, a worthwhile saving will be made in the cost of feeding the flock.

Chicks are housed in range shelters or colony houses when on range. Shelters come nearer to providing ideal conditions so, if both must be used, it is suggested that the sex having the greater value should be placed in the shelters. In most cases the pullets have the greater value but the order is reversed where pedigreed cockerels are raised.

3. Range shelters

Range shelters are small-sized squatty buildings with sides and ends covered with wire netting so that the birds housed in them are assured of abundant ventilation. Sizes range from 6 by 8 feet to 10 by 12 feet or even larger and each accommodates from 75 to 200 birds. Being light in weight, they are easily moved from place to place. Shelters protect the chicks from storms and animal enemies yet give them the unlimited ventilation that accompanies roosting in trees. Details of construction are given in Lesson 4.

PASTURE OF GOOD QUALITY

Note the excellent growth of forage in this picture. (Photo, courtesy of W. L. Whyte, Seaforth, Ont.)

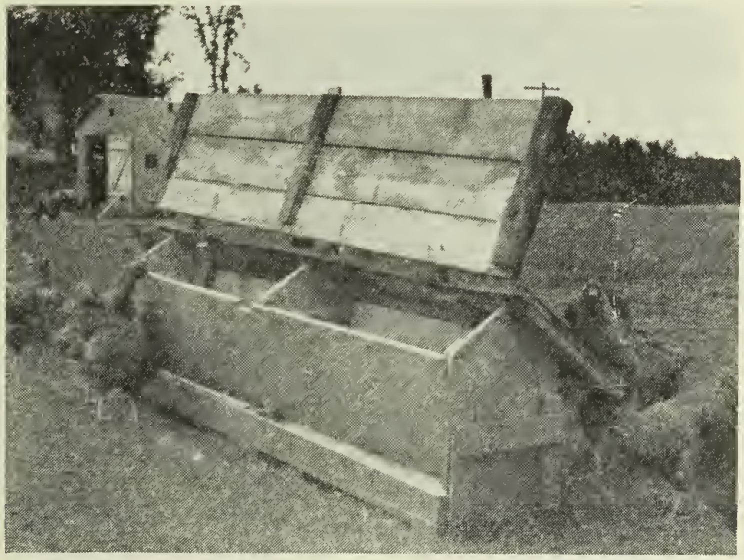
4. Range maintenance

The advantages of raising chicks on a desirable range have been pointed out in Section 2 of this lesson. Many poultrymen place their chicks on reasonably good range but fail to maintain a good growth of forage throughout the summer. It is not possible to outline a plan of maintenance that will suit all conditions. Crops that thrive where there is abundant rainfall may not be satisfactory where the rainfall is light.

Alfalfa, clovers, and many species of grasses make satisfactory range crops and the most valuable feed comes from young, tender growth. Their season of usefulness can be extended by limiting the chick population on any area so that it does not become entirely bare and by mowing the field when the growth becomes old and tough. This action will result in a new growth springing up if there is sufficient moisture in the soil.

The cereal grains, particularly fall rye and oats, furnish a good quality of poultry pasture. The rye makes an early start in the spring and by making several seedings of oats, the period of using cereal pasture can be considerably extended. Corn, swiss chard, and kale grow well in hot weather while rape sown in mid-summer will provide good fall pasture. It is unlikely that any single poultryman will need all these crops but he should select from them those that will give a succession of tender green feed throughout the summer and fall seasons under his conditions of soil and climate.

For the maintenance of good pasture growth, it is inadvisable to place more than 400 birds on one acre of range. Shelters should be moved to new locations occasionally so that the ground surrounding them will not become bare and fouled with droppings. For the same reasons it is advisable to change the location of feed and water containers every few days.



RANGE FEEDER

Both mash and grain can be fed from a feeder such as this when the birds are on good quality range.

5. Rotating the range

To assist in controlling diseases and parasites of poultry, the chicks should not be ranged on the same ground in successive years. Preferably they should not be raised on any area oftener than every third or fourth year and the land should be ploughed, cropped, and reseeded in the intervening period. It is also advisable to withhold applications of poultry manure for at least two years before using an area for range.

6. Range feeders

The amount of labour needed in caring for a flock on range is greatly lessened when hoppers or feeders of large capacity are used. By adding partitions, one feeder can be used for grain, mash, grit, and shell. A range feeder should be non-wasteful from either the chicks pulling out feed as they eat or from wind blowing it out. It should have a watertight roof with one side hinged for easy filling. It may be mounted on skids for easy moving and when in use should be raised from the ground, to prevent decay of the bottom boards, at a height convenient for the chicks to eat from.

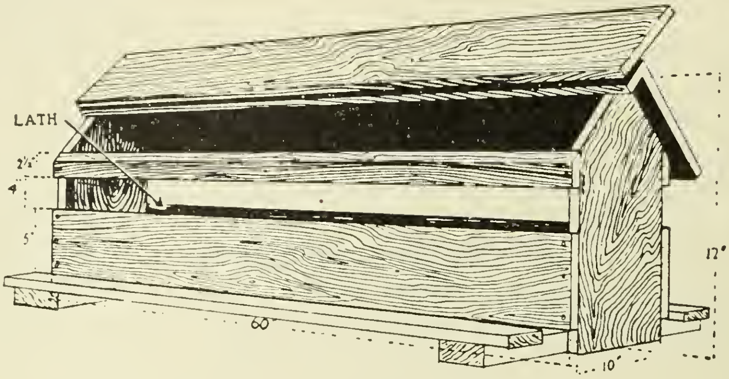
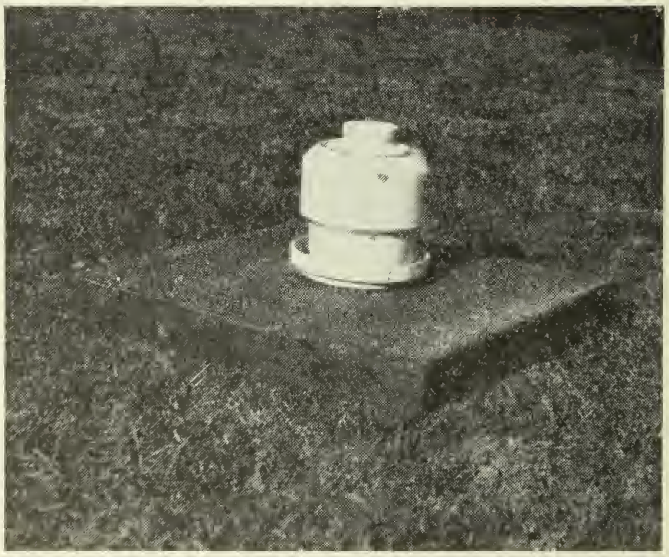


DIAGRAM OF RANGE FEEDER

(Drawing, courtesy of the University of Manitoba.)

7. Range watering systems

A large flock of chickens will consume great quantities of water daily and it is important that it should always be available to them. It is a part of practical management to provide it with a minimum amount of manual labour. With the larger flocks it will pay to have water piped to the range. Each drinking dish can be equipped with a float shut-off so that while there is always water available to the chicks, there is no wastage to keep the ground continually damp near the fount. The pipe for such a system can be laid on top of the ground or in a shallow furrow so that it can be conveniently taken apart for moving from one field to another.



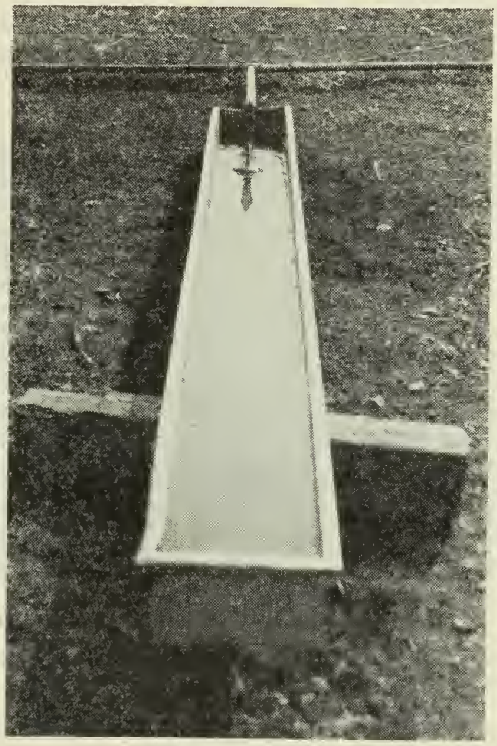
FOUNT ON WIRE PLATFORM

Sanitary management will help prevent loss from diseases and parasites.

There are many types of commercially manufactured waterers that are satisfactory. A practical home-made arrangement is a metal oil barrel fitted with a faucet so that a continuous drip into a pail or pan is possible. The barrel may be mounted on skids or a stone boat for easy moving.

8. Summer management of the growing stock

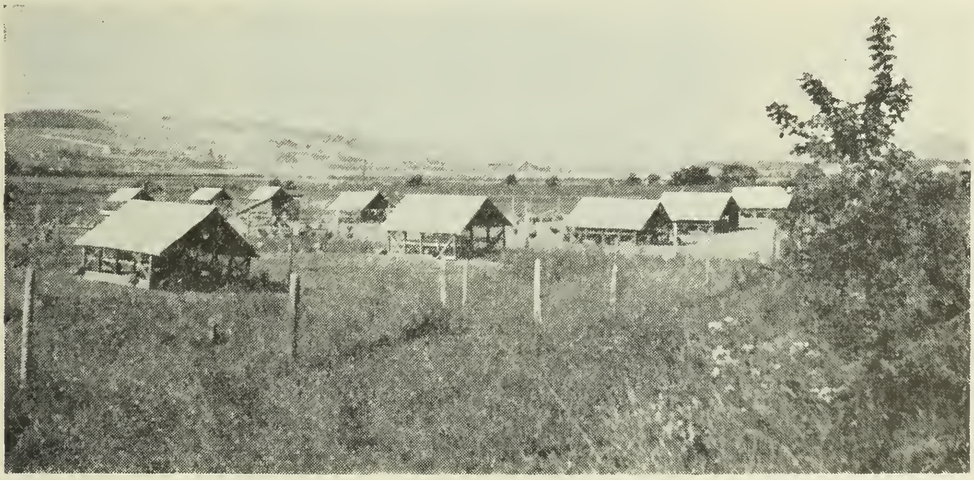
The importance of providing good range and of moving shelters, feeders, and founts from time to time has already been pointed out. It is also essential that the flock be provided with an adequate amount of properly balanced feed. There are other requirements which, while they may seem less important, have a bearing on producing strong and healthy pullets and cockerels.



AUTOMATIC WATER SUPPLY

A system such as this will save a vast amount of work with a large flock.

Chickens of all ages are lovers of shade in hot sunny weather and it is important that some should be provided. Trees provide ideal shade if not so dense that the ground is continually damp beneath them. Where there is no natural shade it is advisable to plant a few rows of corn or sunflowers. These crops will need protection from the chicks until they are well started.



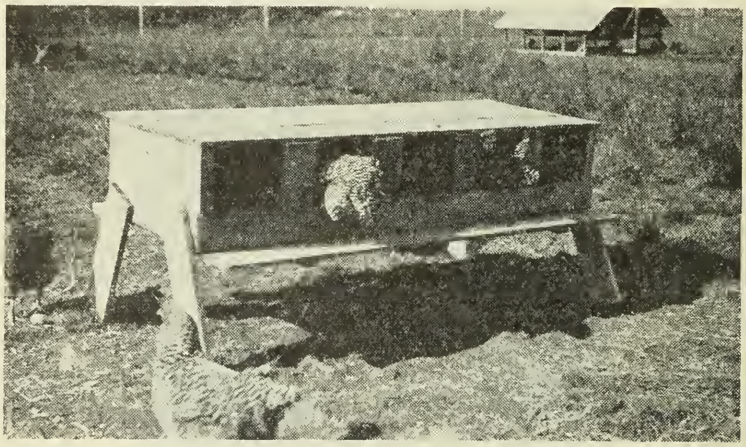
SHELTERS DISTRIBUTED ON RANGE

Distribution of shelters and moving their locations occasionally are factors in maintaining range of good quality.

Growing chicks should be kept entirely apart from mature stock because the older birds are often carriers of disease organisms and parasites that can be readily transmitted to the young stock if the two are ranged together. Where the flock is large enough to warrant having different caretakers for old and young stock it is a sound practice to follow.

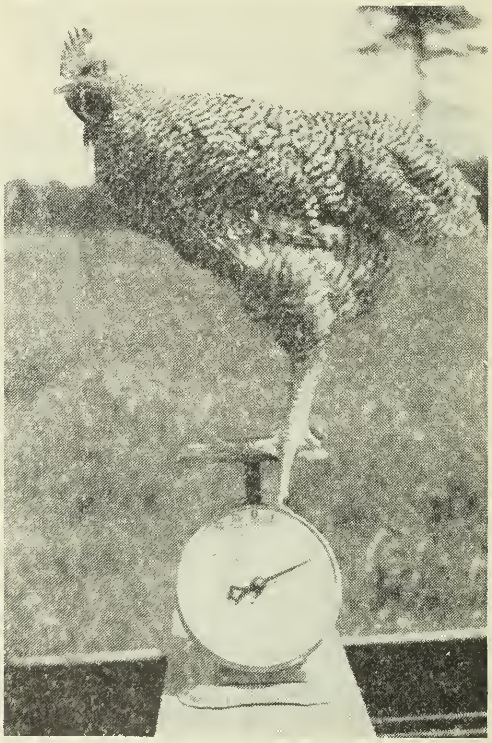
Mites often get established in brooder houses and range shelters in hot weather before their presence is suspected. They will cause serious lack of vitality and the caretaker should always be on the lookout for them. Control measures are given in Lesson 18.

Extensive culling is not usually required through the summer season, but when chicks so unthrifty that they are unlikely to be profitable are noticed, they should be killed.



OUTDOOR NESTS

These will prevent the soiling and breaking of eggs when pullets begin production before being moved to the laying house.



TYPICAL FOUR-MONTH-OLD COCKEREL

When it becomes apparent that egg production is about to start, a few outdoor or range nests should be set up near each shelter. These can be simple in construction but should have a water-tight roof so that the nest litter will not become damp in rainy weather. The installation of nests of this type will encourage pullets to lay in nests and discourage the annoying habit of their laying on the floor.

9. Estimating mortality

The beginner in poultry raising is always faced with the question of probable mortality in his flock. This naturally varies but the following figures are conservative and should be helpful. During the first three weeks mortality will range between 2 and 15 per cent and during the remainder of the growing season between 2 and 10 per cent. The person who buys his chicks and wants to house 100 good pullets should purchase 125 pullet or 250 mixed-sex day-old chicks. One who does his own hatching should count on needing two eggs to produce one chick or five eggs to produce one mature pullet. Three cockerels of broiler age should be retained for every good mature breeding male needed.

10. Feed consumption and growth tables

Every poultryman should be able to estimate the feed requirements of his flock. Beginners in poultry raising seldom realize how rapidly the feed intake of a growing flock increases. Too often, insufficient capital is retained for the purchase of feed, with the result that the chickens suffer from underfeeding. In the tables which follow, the feed consumption of Barred Plymouth Rock and White Leghorn pullets, cockerels and capons, is shown. It should be borne in mind that both feed consumption and growth rate will vary greatly under different conditions. Reduced to round figures, it will require from 800 to 1,000 pounds of feed to produce 100 broilers; about 2,000 pounds to produce 100 light roasters; and between 2,500 and 3,000 pounds to grow 100 pullets to laying age. One hundred laying hens will consume about 25 pounds of feed daily. These figures are for the combined amounts of mash and grain feeds given.

TABLE 1.—WEEKLY BODY WEIGHTS AND FEED CONSUMPTION FOR PULLETS, COCKERELS AND CAPONS, BARRED PLYMOUTH ROCKS.

Age in weeks	PULLETS			COCKERELS			CAPONS		
	Average weight per bird	Average feed consumed per bird	Lb. feed per lb. body weight	Average weight per bird	Average feed consumed per bird	Lb. feed per lb. body weight	Average weight per bird	Average feed consumed per bird	Lb. feed per lb. body weight
0	·08	....	....	·08	....	....	·08	....	....
1	·16	·14	·88	·17	·14	·82	·16	·14	·88
2	·22	·38	1·72	·22	·38	1·73	·22	·38	1·73
3	·38	·66	1·74	·34	·66	1·94	·34	·66	1·94
4	·57	1·10	1·93	·50	1·10	2·20	·54	1·10	2·04
5	·76	1·74	2·29	·80	1·74	2·18	·83	1·74	2·10
6	1·05	2·36	2·25	1·13	2·51	2·22	1·14	2·48	2·18
7	1·42	3·20	2·25	1·49	3·45	2·32	1·31	3·13	2·39
8	1·72	4·22	2·45	1·93	4·48	2·32	1·66	3·78	2·28
9	1·86	5·32	2·86	2·09	5·77	2·76	1·96	4·85	2·47
10	2·07	6·29	3·04	2·33	6·87	2·95	2·22	5·85	2·64
11	2·32	7·39	3·19	2·72	8·36	3·07	2·52	6·70	2·66
12	2·49	8·49	3·41	3·07	9·90	3·22	2·73	8·01	2·93
13	2·71	9·52	3·51	3·22	10·99	3·41	2·82	9·09	3·22
14	2·92	10·77	3·69	3·34	12·49	3·74	3·13	10·49	3·35
15	3·15	12·11	3·84	3·65	14·09	3·86	3·46	11·94	3·45
16	3·47	13·62	3·93	4·03	15·86	3·94	3·83	13·68	3·57
17	3·84	15·27	3·98	4·52	17·84	3·95	4·45	15·74	3·54
18	4·05	16·78	4·14	4·76	20·33	4·27	4·91	18·11	3·69
19	4·08	18·21	4·46	5·23	22·68	4·34	5·09	20·26	3·98
20	4·31	19·73	4·58	5·59	24·79	4·43	5·44	22·26	4·09
21	4·49	21·82	4·86	5·82	26·96	4·63	5·57	24·49	4·40
22	4·63	23·99	5·18	6·05	29·23	4·83	5·46	26·67	4·88
23	4·84	25·55	5·28	6·43	31·64	4·92	6·49	29·01	4·47
24	5·11	27·53	5·39	6·70	33·65	5·02	6·67	30·89	4·63
25	5·22	29·34	5·62	6·87	35·78	5·21	6·72	32·82	4·88
26	5·41	30·86	5·70	6·91	37·64	5·45	6·98	34·79	4·98

Table 2.—WEEKLY BODY WEIGHTS AND FEED CONSUMPTION FOR PULLETS, COCKERELS AND CAPONS, WHITE LEGHORNS.

Age in weeks	Pullets			Cockerels			Capons		
	Average weight per bird	Average feed consumed per bird	Lb. feed per lb. body weight	Average weight per bird	Average feed consumed per bird	Lb. feed per lb. body weight	Average weight per bird	Average feed consumed per bird	Lb. feed per lb. body weight
0	·08	....	....	·08	....	....	·08	....	....
1	·15	·14	·93	·15	·14	·93	·14	·14	1·00
2	·19	·38	2·00	·19	·38	2·00	·19	·38	2·00
3	·24	·69	2·87	·23	·69	3·00	·25	·69	2·76
4	·33	1·16	3·51	·31	1·16	3·74	·36	1·16	3·22
5	·46	1·75	3·80	·44	1·75	3·98	·48	1·75	3·65
6	·63	2·38	3·78	·62	2·38	3·84	·67	2·38	3·55
7	·85	3·08	3·62	·89	2·98	3·35	·87	2·94	3·38
8	1·07	3·94	3·68	1·16	3·84	3·31	1·12	3·71	3·31
9	1·30	4·76	3·66	1·46	4·79	3·28	1·39	4·69	3·37
10	1·43	5·72	3·86	1·17	5·84	3·42	1·67	5·81	3·48
11	1·64	6·46	3·94	1·90	6·75	3·55	1·93	6·80	3·52
12	1·76	7·23	4·11	2·11	7·79	3·69	2·19	7·64	3·49
13	1·95	8·23	4·22	2·37	8·74	3·69	2·52	8·75	3·47
14	2·15	9·15	4·26	2·72	9·88	3·63	2·66	9·85	3·70
15	2·47	10·22	4·14	3·20	11·20	3·50	3·09	11·13	3·60
16	2·66	11·44	4·30	3·40	12·69	3·73	3·35	12·64	3·77
17	2·85	12·80	4·49	3·75	14·40	3·84	3·68	14·30	3·89
18	3·07	14·18	4·62	4·03	16·21	4·02	3·96	16·12	4·07
19	3·19	15·82	4·96	4·30	18·12	4·21	4·29	18·20	4·24
20	3·18	17·11	5·38	4·24	19·76	4·66	4·34	19·87	4·58
21	3·37	18·68	5·54	4·28	21·52	5·03	4·77	21·99	4·61
22	3·55	20·05	5·65	4·71	23·36	4·96	4·85	23·91	4·93
23	3·67	21·40	5·83	4·78	25·08	5·25	5·08	25·81	5·08
24	3·70	22·59	6·11	4·88	26·55	5·44	5·11	27·49	5·38
25	3·78	23·75	6·28	4·92	28·43	5·78	5·26	29·10	5·53
26	3·93	25·00	6·36	5·07	29·55	5·83	5·37	30·83	5·74

Note.—Feed consumption is cumulative, the figures for 26 weeks, for example, representing consumption per bird from hatching to that age. Pounds of feed per pound of body weight represents the cost in terms of feed consumption of each pound of body weight up to any given age. Data from Central Experimental Farm, Ottawa.

11. Broiler production

Broilers are chickens that are killed when approximately three months old and are in demand in the larger centres of population. Canadian requirements come almost entirely from surplus cockerels in farm flocks but broiler production is a highly specialized business in some parts of the United States. In the area comprising parts of the states of Delaware, Maryland, and Virginia known as the Delmarva Peninsula, the raising of broilers is conducted on a gigantic scale.

For specialized broiler production, birds are needed that feather rapidly, grow quickly and uniformly, and produce plump carcasses. Both cockerels and pullets are used. The favoured bird in the Delmarva area is the cross produced by mating Barred Plymouth Rock males with New Hampshire or Rhode Island Red females. Each grower raises three crops of broilers annually thus keeping his house and equipment in almost continuous use.

In broiler production, the profit per bird is small. If the business is to be profitable there must be low mortality, steady and rapid growth, freedom from culls, and a satisfactory price for the meat.

12. Promoting good habits

A little extra care with the pullet flock will do much to promote the good habits which make it a pleasure to look after a flock of laying hens.

Feather pulling is a common vice among laying hens that often leads to cannibalism. It may be difficult to determine the cause but overcrowding, faulty diets, and irregularity in caring for the flock are often underlying causes. Chickens get nervous and restless if not fed and watered at the usual hour and under such circumstances are prone to start these vices. The precautions to be taken are obvious.

Hens prefer to lay in nests and these should be provided before the pullets start to lay. They will thus learn to use the nests in preference to laying on the ground or floor.

A little training which includes placing the birds on roosts for a few successive nights will prevent the bad habit of floor roosting.

13. Transferring to laying quarters

Before the pullets are put in the laying house, any necessary repairs should be made to the building and it should be thoroughly cleaned and disinfected. After the building is well dried out, fresh litter should be placed on the floor. Where a system of deep litter is followed, the layer should be at least 6 inches deep in the beginning and additions are made from time to time during the fall and winter.

The transfer from range shelters to winter laying quarters should be made before laying is general in the flock. During the move, the birds should be handled as carefully and with as little excitement as possible. Outbreaks of colds are common following the transfer to laying houses. The best known measures of prevention are to avoid overcrowding and provide plenty of ventilation without draughts.

The change from growing to laying diet should be made gradually and completed when the pullets have reached a production of between 10 and 20 per cent.

14. Maintaining high egg production

Skill in the management of the pullets after they have been placed in winter quarters has a very important bearing on whether or not the flock will be profitable. Poultrymen differ greatly in the skill they display at this time and beginners should study and follow the routine of those who are successful.

Pullets that have been bred for egg production, that have been well fed throughout the growing season, and that carry a good reserve of body fat usually respond well to an egg-producing diet. If egg production does not increase satisfactorily it may be advisable to increase the protein content of the diet slightly or to stimulate the birds' appetites by giving them one feeding of moist mash daily. A lagging in egg production is sometimes due to the presence of external or internal parasites but usually the body weight is low when parasites are present.

Poultry feeding principles and practices are explained in detail in Lessons 8, 9 and 10 but an explanation of how to increase the protein content of the diet follows. Where grain and mash mixtures are being fed it is seldom necessary to change the composition of either. Mashes in general contain more protein than grain mixtures so all that is necessary is to increase the amount of mash eaten and to decrease the grain allowance. Hens prefer grain to mash so if the daily allowance of grain is restricted they will make up their food requirements by eating mash. Such a change must be made with caution, however. If egg production is unduly stimulated by increased protein feeding, the pullets will cease to gain in weight as they normally do and may even lose weight. When this happens the flock is likely to undergo a partial moult which is accompanied by a drop in egg production which usually lasts for several weeks. Winter moults result in decreased income. Skilful management is required to prevent them.

Prior to being placed in laying quarters, the flock is usually on range where it receives an abundance of fresh air and green feed. The birds will naturally not receive either to the same degree after being enclosed but a reasonable provision of both is necessary if the transfer is to take place with a minimum disturbance to the flock.

15. Summer management of adult stock

In the summer management of laying hens it is necessary to adjust the diet to suit warm weather needs and to provide the birds with adequate ventilation. Hens need less heat-producing nutrients in summer than in winter and this requirement is met by feeding a smaller percentage of grain in the total diet during the summer. Hens suffer greatly in very hot weather and it is particularly important that the best possible ventilation be provided in the summer months.

With large flocks of laying hens, the most common practice is to keep the birds enclosed throughout the summer season. If the hens are adequately fed, egg production does not suffer from this treatment. When hens are to be kept for a second year's egg production, it is advisable, where possible, to keep them on good range for part or all of the summer season. This is particularly true if they are to be used for breeders in the following year. Under these circumstances it may be advisable to so manage the flock that the birds will undergo their annual moult in midsummer and resume egg production in the early fall.

A moult can be induced by reducing the feed supply for a few days. Mash is withheld entirely and the grain supply is considerably reduced. General moulting of the flock follows and, when well established, the feeding of a diet that is reasonably high in protein and therefore favourable to the growth of feathers is begun. The birds quickly regain their plumage and return to egg production at a season when eggs are scarce and high in price. A forced moult of this nature can be induced either with birds that are enclosed or on range but the growth of new plumage and return to egg production will be most rapid when the birds are on range of good quality.

In most cases it pays to kill male birds as soon as the breeding season is over. In pedigree breeding, however, it is often advisable to keep cock birds for two or more years. Where possible they should be placed on range during the summer season.

16. Laying shelters

Permanently located large-size shelters have many advantages for the housing of hens in summer but are not extensively used in Canada. They are built much like range shelters but on a larger scale. The posts are usually about 5 feet high and each building 20 or 24 feet square. Floors are of concrete and the roof is of the gable type. One end and the sides for a distance of 10 or 12 feet from the end are tightly boarded to form a protected area for roosts and nests. The remainder of the side walls is covered with wire netting. The gable ends are boarded but each has an opening for ventilation. Birds receive considerable direct sunlight when housed in shelters of this type even when it is impossible to allow them out on range.

LESSON 8

POULTRY FEEDING PRINCIPLES

Topics for Study

1. Nutrient requirements.
2. Protein.
3. Carbohydrates.
4. Fats.
5. Minerals.
6. Vitamins.
7. Water.
8. Fibre.
9. The importance of balance between nutrients.
10. Considerations in selecting feeds.

Because chickens are small in size and have a low individual money value, they have been popular subjects for research work in feeding and, as a result, poultry feeding is fast becoming a rather exact science. This lesson is designed to explain briefly the principles of nutrition and the two lessons which follow discuss the feeding stuffs which are commonly used in making up poultry diets and common feeding practices.

1. Nutrient requirements

The nutrients of which feeds are composed are proteins, carbohydrates, fat, minerals, vitamins and water. Each nutrient has a distinct function to perform in animal nutrition and with few exceptions one is unable to take the place of another. The nutrients are found in various combinations in the different feeding stuffs. They cannot be distinguished by their appearance but a chemist can tell by analysis the percentage of each present with the exception of vitamins. With vitamins feeding tests may be necessary to determine the amount present.

In any livestock feeding the first consideration is the maintenance of the body. With the hen it will probably take from 70 to 80 per cent of all she can eat to maintain her body. It is only from food given in excess of that needed for body upkeep that a chicken can grow, add body fat or produce eggs. In theory and in practice we know that we must provide, not only enough food but that it must be of the right sort or composition.

2. Protein

Proteins are distinguished from other nutrients by the presence of nitrogen in their chemical make-up. In addition to nitrogen, they always contain carbon, hydrogen, and oxygen and may contain sulphur, phosphorus, and iron. They are made up of simpler substances known as amino acids and are broken down to form these during the process of digestion. There are at least 22 amino acids which are necessary to support life and 11 of these must be supplied in the food because they cannot be manufactured in the bodies of the birds. These 11 are spoken of as essential amino acids and most of them are found only in animal tissues. This explains why animal protein supplements are always included in the chicken's diet and why they are necessary for satisfactory growth and production.

Proteins are used by the chicken in the growth of muscles, nerves, feathers, bones, beaks, nails, and skin and in producing the whites of the eggs. All grains contain some protein but not in sufficient quantities to meet the chickens' needs. Moreover, the proteins in cereal grains do not contain all the 11 essential amino acids. It is therefore a general practice to supplement grain feeding with such materials as meat scrap, fish meal, and milk products.

3. Carbohydrates

Carbohydrates are made up of the elements carbon, hydrogen, and oxygen and are used in poultry nutrition to supply heat and energy, for the production of body fat, and for the development of egg yolks. Heat is needed to keep the birds' bodies warm in cold weather and energy is required in all body activities such as the search for food and the subsequent eating and digestion of food and transportation of it to all parts of the body.

Carbohydrates include the more readily digestible sugars and starches and also the fibrous and less digestible materials such as are found in oat and barley hulls. When hens receive a surplus of carbohydrates it is converted into fat which is stored in the body tissues and glycogen which is stored in the liver. In either case, the stored product can be drawn upon as a source of energy. The greater part of carbohydrates in the chicken's diet comes from the cereal grains.

4. Fats

Fats, like carbohydrates, supply heat and energy and, in addition, they perform other complex functions. In proportion to their weight, fats supply about two and a quarter times as much heat and energy as carbohydrates. Feeds containing much fat tend to become rancid easily. Because of this and the fact that the digestive system of the chicken can use carbohydrates to better advantage than fats, no special effort is made to add fat to the chicken's diet except occasionally during the fattening period. At other periods the birds get sufficient fats from the ordinary grain feeds.

5. Minerals

The mineral content of any feeding stuff is that part which remains after complete burning. Minerals are used in the growth of the bones, to a lesser extent in muscles and blood and to a large extent in producing the shells of eggs. Because of the large amount of mineral matter needed in producing egg shells, laying hens require a higher percentage of minerals in their diets than other farm animals. The minerals to which special attention is paid are calcium, phosphorus, sodium, chlorine, manganese, and occasionally iodine. Definite mineral shortages will result in cessation of egg production and in some cases in the development of deficiency diseases. Practically all feeding stuffs contain some minerals but marine shells, limestone grit, bonemeal, and salt are quite commonly used and, in some cases, manganese sulphate and iodized salt are necessary.

6. Vitamins

Vitamins are necessary for the health, growth, and reproduction of all animals. They are rather complex in their chemical make-up and when first discovered their composition was unknown but in most cases it is now well understood. Some vitamins can be dissolved in water and are termed "water soluble" while other can only be extracted from foods with such solvents as ether and alcohol and are termed "fat soluble". Some vitamins are destroyed by heat while others are quite resistant to it. The value of some is lost when the food containing it is exposed to the air while others are quite stable. The amount of vitamins present in foods and the amount needed in animal nutrition is a very minute percentage of the total. In some cases the amount present can be determined by physical or chemical tests while with others, feeding or biological tests are necessary. Because of the very small amounts considered, vitamin requirements are stated in terms of units rather than percentages as with the other nutrients. The units vary with the respective vitamins. A total absence of any needed vitamin results in a specific disease while partial deficiency in one or more vitamins results in general unthriftiness. The following discussion includes the vitamins which must be given most consideration in the feeding of chickens.

(*a*) *Vitamin A.*—This vitamin is necessary for normal health, growth, egg production, and hatchability of eggs and helps prevent body infections. When lacking in the diet, soreness of the eyes and pimple-like pockets in the roof of the mouth and gullet are conditions commonly found.

Vitamin A is fat soluble and found only in the fatty parts of feeds. However, the product known as carotene, which is found in abundance in green plants and carrots, can be changed into vitamin A in the livers of birds. During the growing season, grasses, clovers, and alfalfa together with other green feeds are the most common sources of vitamin A. For winter feeding, fish oils and dried and dehydrated grasses, clovers, and alfalfa are used.

(*b*) *Vitamin B.*—What was formerly known as vitamin B is now called vitamin "B Complex" because it consists of several distinct vitamins. All of these are water soluble. Many of them are present in sufficient quantities in common poultry feeds but three, riboflavin, choline, and pantothenic acid may be lacking to the extent that deficiency diseases result.

When riboflavin is not present in sufficient amounts in the diet of laying hens there will be high embryo mortality when their eggs are incubated. In addition, it is necessary for the normal growth of chicks and when lacking, chicks are affected with what is commonly called "curled toe paralysis". With this condition there is a characteristic curling inward of the toes of the chicks. Riboflavin is found in liver meal, yeast, all milk products, and in both green and dehydrated grasses and alfalfa. Fish and meat meals and the cereal grains are also fair sources of this vitamin.

The absence of choline is a contributing factor to the condition known as perosis or slipped tendon that is sometimes found among growing chickens and turkeys. This vitamin is found in fishmeal, meat scraps, liver, milk products, grains, wheat by-products, and soybean meal.

When pantothenic acid is lacking from the diet, the chicks develop scabby sores in the corners of their mouths, the eye lids stick together, the skin of the toes and feet thickens and cracks form in it. Pantothenic acid is found in dried milk products, green and dried grasses and alfalfa, the cereal grains, wheat by-products and molasses.

(*c*) *Vitamin D.*—An absence of vitamin D in chick diets will result in rickets and when hens do not receive a sufficient amount, egg production declines, the eggs have shells of poor quality and they do not hatch well. In rickets, the bones do not harden normally and even when bone-forming mineral elements are present in sufficient quantities, they cannot be utilized by chickens unless vitamin D is present. When chickens have access to direct sunlight or to the rays of special lights such as carbon arc and quartz-enclosed, mercury-vapour lamps, it is possible for vitamin D to be produced in the skin. Vitamin D is not found to any extent in common poultry feeding stuffs. The common supplements are fish liver oils synthetic vitamin D products.

(*d*) *Vitamin E.*—This vitamin is necessary for normal reproduction including the hatchability of eggs. When there is a complete absence of vitamin E, sterility of the birds results. Vitamin E is found in the germs of cereal grain kernels so naturally all grains are sources of supply. It is found in the most concentrated form in wheat germ oil. Grasses and alfalfa in both the green and dehydrated forms carry an abundant supply. Vitamin E is carried so abundantly in common poultry feed ingredients that it is seldom given special consideration.

(*e*) *Vitamin K.*—Vitamin K plays a part in the normal clotting of blood. When lacking, profuse bleeding may cause the death of birds. It is found in many green feeds and particularly in the alfalfa products.

7. Water

Water has many functions in poultry nutrition. It softens the food, helps in the process of digestion and absorption and in the transportation of food to all parts of the body. It helps in the removal of waste products through the digestive system, the kidneys, and the lungs. It enters into body tissues to such an extent that it makes up about 60 per cent of the weight of the body. The hen's product, the egg, is nearly two-thirds water. Hens will die more quickly if deprived of water than if left entirely without food.

Practically all feeds contain some water but the hens' needs are met by providing drinking water. Large quantities are consumed to replace that which is lost in the breathing process, in the droppings and, with laying hens, in the eggs produced. Water should be provided in a sanitary manner and in such a way that it will not become spilled in the floor litter.

8. Fibre

Fibre is made up mainly of the woody parts of plants and has very little nutritional value. Oat and buckwheat hulls and alfalfa stems are examples of products that contain a high percentage of fibre. Such materials are indigestible but seem to have some value in separating or keeping apart the finely ground food particles so that the digestive juices have a better chance to act on them.

9. The importance of balance between nutrients

A feed in which the nutrients are present in the proper proportions for the feeding purpose in mind is called a balanced feed. Since nutrient requirements are different for starting, growing, and fattening chicks and for the feeding of laying hens it is necessary to have feed mixtures that are balanced for these specific feeding purposes. The balanced feed is as near ideal for the purpose intended as we know how to make it. What happens when a feed lacks balance can be shown by an example.

We will suppose for the purpose of illustration that 100 hens are fed wheat only. We will assume that the hens will live and thrive on this wheat diet although we know that in practice they will not. While wheat is one of the most desirable grains for poultry feeding, its nutrients are poorly balanced when we consider it as the sole feed. So poorly is it balanced that our 100-hen wheat-fed flock will receive enough carbohydrates to give a daily egg production of 300 eggs, enough protein to produce 35 eggs and enough mineral matter to supply shell making material for 8 eggs only. The individual hens will receive enough carbohydrates to lay 3 eggs each day, enough protein to lay one egg every third day and enough mineral matter to lay one egg every 12 days. If we consider 50 eggs a reasonably good daily egg production from the flock, it is at once apparent that there will be an enormous waste of carbohydrates, a shortage of protein and a still greater lack of mineral matter in the food eaten daily.

Oats and barley are little, if any, better than wheat from the standpoint of balance of nutrients and corn is definitely poorer because it is decidedly lacking in protein and mineral matter. What protein is present in corn is of lower quality than that which is found in wheat. Even though there is a lack of balance in nutrients in these grains when considered alone, they are all very useful ingredients for poultry diets when used in combination with other materials which contain the nutrients in which they are lacking.

There are very few instances in which one nutrient can replace another in animal nutrition. Therefore, for successful and economical feeding, mixtures must be prepared which will supply enough of the required nutrients without waste.

10. Considerations in selecting feeds

Where feeds are prepared at home it is not always possible to use the same mixture continuously. Changes must be made from time to time to make use of the ingredients that are available and reasonable in price. When changes are necessary, they should be made gradually. In the selection of ingredients to formulate a diet for any specific purpose, consideration should be given to such factors as composition, digestibility, palatability, availability, suitability, quality, variety, succulence, and cost.

(*a*) *Composition.*—Attention should be paid to the nutrients in any feeding stuff. These include protein, energy-producing factors (carbohydrates and fat), minerals, and vitamins. Tables of analyses of all common poultry feeds are to be found in Publication 541 of the Dominion Department of Agriculture.

(*b*) *Digestibility.*—The digestive system of the chicken is not so well adapted to the use of coarse and bulky feeds as that of a cow and, for this reason, feeds that are low in fibre are preferred. In practice it is often necessary to use a feed that is not especially high in digestibility because of its superiority in some other respect such as its vitamin or mineral content.

(*c*) *Palatability.*—Palatability depends to quite an extent on the physical condition of the food. Chickens do not like feeds that are either too coarse or too fine. The diet should be reasonably bulky without too much fibre and of a nature that it does not become sticky when wet.

(*d*) *Availability.*—Before a feed ingredient is selected for poultry feeding, the poultryman should have reasonable assurance that it will be continuously available.

(*e*) *Suitability.*—Some feeding stuffs, although rich in needed nutrients are not suitable for poultry feeding, because of the unfavourable effect they have on either the chicken or its products. Examples of the former group are rye, oilcake meal, and mouldy or otherwise tainted food, all of which set up digestive disturbances. Cottonseed meal belongs to the latter group and if fed extensively to laying hens, the yolks of the eggs produced become discoloured when held in storage. Yellow corn, alfalfa, clovers and grasses all tend to produce egg yolks of a rich, deep yellow which are objected to in some markets.

(*f*) *Quality.*—The ingredients of a poultry diet should be of good quality. Light weight oats, barley and buckwheat are feeds of poor quality because of their high percentage of fibrous hull.

(*g*) *Variety.*—A variety of feeds is necessary in order that the needed nutrients will be provided and, in addition, variety has a stimulating effect on the appetites of the birds.

(*h*) *Succulence.*—Some succulent feeds such as alfalfa, clovers, and grasses are relatively rich in needed vitamins and minerals. Others like mangels and turnips have little to commend them other than their juiciness. Such feeds add variety to the diet and, when fed in moderation, do no harm although their true value is questioned.

(*i*) *Cost.*—The most economical diet may not be either the cheapest or the most expensive. It will be the one which gives the greatest margin of profit. Cost accounts and record keeping as explained in Lesson 19 will assist the flock owner in knowing when a feed mixture gives economical results. A properly balanced and palatable feed is necessary but needless expense should be avoided.

LESSON 9

THE FEEDS AND THEIR USE

Topics for Study

1. Grains and their by-products.
2. Animal feeds.
3. Mineral feeds.
4. Green and succulent feeds.
5. Vitamin feeds.
6. Feeding methods.
7. Management.
8. Formulating feed mixtures.

Grains and their by-products form the basis of poultry diets but do not contain enough of all the needed nutrients. It is therefore necessary to add supplements which will make up the existing deficiencies. In this lesson we consider the grains and supplements which are commonly used in formulating poultry diets.

1. Grains and their by-products

Barley, corn, oats, and wheat and by-products of these are extensively used in poultry feeding. Barley, oats, and wheat are raised extensively in all provinces of Canada. Corn is raised as a grain crop in only a few areas but large quantities have been imported from United States, South America, and South Africa. These grains, their by-products, and some of the less common feeding stuffs derived from grains are described here.

(*a*) *Barley.*—Good plump barley is a satisfactory poultry feed and is used extensively in grain mixtures for growing chicks and mature birds. For young chicks it is fed in cracked form. Barley has a coarse hull which makes it less palatable than corn and wheat. It has a lower percentage of digestible nutrients than both these grains but is higher than oats in this respect. Barley is used extensively as a substitute for corn when the latter is not available or is too high in price. It lacks the vitamin A which corn contains but is a satisfactory substitute for corn when supplemented in this regard.

(*b*) *Barley meal.*—Barley meal or ground barley is a valuable ingredient for laying and fattening mashes. Because of its fibrous hull, barley should be finely ground.

(*c*) *Brewers' grains* and *malt sprouts.*—These by-products of the brewing industry are composed largely of barley and are sometimes used in poultry feeding. Both are fairly high in protein and the B vitamins but also rather high in fibre content and are not specially palatable to poultry.

(*d*) *Buckwheat.*—Where buckwheat is grown, it can be used to good advantage in grain mixtures for growing chickens and mature birds. It has a high percentage of indigestible hull and because of its dark colour, is likely to be unattractive unless the birds have become accustomed to it as chicks. Ground buckwheat is a valuable ingredient for fattening mashes.

(*e*) *Corn.*—Corn is grown commercially as a grain in only a few restricted areas in Canada. It is one of the most valuable grains for poultry feeding and great quantities have been imported from other countries for this purpose. Corn is very palatable to hens and has a high percentage of digestibility. It is lacking in protein and mineral matter when compared with other grains and must be supplemented accordingly. Yellow corn, which is used to the greatest extent, is a good source of vitamin A whereas the other grains are not. When available at a satisfactory price, it can be used to make up a large percentage of the feed mixtures for poultry of all ages. Because of its high oil content, corn has a tendency to heat and should be kiln dried.

(*f*) *Cornmeal.*—When cornmeal is ground from grain of good quality, it has all the desirable features of the whole or cracked grain. It is used in mash mixtures for all feeding purposes. Meal ground from white corn should be used in fattening mixtures when "milk-fed" poultry is desired because yellow corn will give a yellow colour to both the fat and the skin.

(*g*) *Corn gluten feed* and *corn gluten meal.*—These are by-products of the manufacture of corn starch and corn syrup and are sometimes used in poultry feed mixtures. They are palatable and contain a high percentage of protein but since corn proteins are of rather poor quality for poultry feeding these products are usually fed to other farm animals.

(*h*) *Hominy feed.*—This is a by-product of the manufacture of table cornmeal and compares quite favourably with cornmeal in composition and use. It is specially desirable as a fattening feed. It is derived from both yellow and white corn and for the production of "milkfed" poultry should be manufactured from the latter.

(*i*) *Kafir* and *milo.*—These grains are not grown in Canada but are frequently found in commercially prepared grain mixtures for growing chicks. They resemble corn in feeding value but have a slightly higher fibre content.

(*j*) *Linseed meal.*—Linseed meal is made from the residue after flaxseed has had the oil extracted from it. This is a very desirable protein supplement for the feeding of dairy cattle but has not proved satisfactory for poultry.

(*k*) *Millet.*—Millet has a very small kernel and is most used in grain mixtures for small chicks. The percentage of fibre is fairly high and the protein content similar to that of oats and barley.

(*l*) *Oats.*—Oats are grown in all parts of Canada and are widely used in poultry feeding. Their coarse, heavy hull gives them a high fibre content and makes them less palatable than wheat and corn. Plump, heavy oats are desirable but light weight oats contain too high a percentage of hull to be satisfactory.

(*m*) *Oat groats.*—Machine hulled oats are called oat groats and are very valuable when fed, either whole, cracked, or ground to any class of poultry. The use of oat groats is often limited because of their high price. Hulless oats are similar in appearance and value to oat groats and both products must be well dried so that they will not heat and mould.

(*n*) *Ground oats.*—Ground oats are a valuable ingredient for growing, laying, and fattening mashes. When fed to young chicks, any coarse hulls should be sifted out.

(*o*) *Rolled oats* or *oatmeal.*—Before commercial chick starting feed mixtures were as generally available as at present, rolled oats were often given as a first feed for chicks. They are valuable from a nutritional standpoint for chickens of any age but are usually too high in price for general use.

(*p*) *Rye.*—Although the composition of rye is similar to that of wheat, it is unpalatable to poultry and otherwise unsatisfactory as a poultry food.

(*q*) *Soybean meal.*—This product is made from the residue after oil has been extracted from soybeans. It contains a high percentage of protein which is of better quality than other vegetable proteins. The use of soybean meal in poultry mashes has greatly increased in recent years.

(*r*) *Sunflower seed.*—Sunflower seed has a very high oil content and has long been considered a valuable feed for adding a gloss to the plumage of birds being fitted for exhibition. Many commercial grain mixtures for laying hens contain a small percentage of sunflower seed. Because of the high oil content, sunflower seed must be well dried to prevent heating and moulding.

The production of sunflower seed for oil extraction has increased greatly in recent years and meal made from the residue after the extraction has given indications of being a very desirable protein supplement for poultry feeding.

(*s*) *Wheat.*—Wheat is one of the most valuable grains for poultry feeding and is used more extensively than any other in Canada. It is palatable, low in fibre, and contains a high percentage of digestible nutrients. Plump grain is preferred by the birds but shrunken wheat, if shrunken because of drought or frosting, contains a higher percentage of protein than plump wheat and is often a much more valuable feed than its appearance indicates. Wheat is fed ground in mash mixtures for chickens of all ages, cracked for the fine grain mixtures and whole in grain mixtures for growing chicks and mature birds.

(*t*) *Wheat bran.*—Bran, a by-product in flour milling, is flaky in nature and is used to add bulk and lighten the more concentrated or heavier mashes. Practically all mashes for growing chicks and laying hens contain some bran.

(*u*) *Wheat shorts.*—Shorts are the second by-product of flour milling and midway in texture between bran and middlings. They are slightly higher in protein content than bran and lower in fibre. Because of their lower fibre content and finer nature, shorts are used extensively in commercial mashes for young chicks.

(*v*) *Wheat middlings.*—Middlings are the third by-product in flour milling and are lower in fibre and mineral matter than bran but higher in carbohydrates. Middlings are fine and inclined to become pasty when wet so should be used along with ingredients that are coarser or more flaky in nature. They are used in mash mixtures for chickens of all ages and are the most satisfactory of the three by-products of flour manufacture for fattening mashes.

2. Animal feeds

Since the common grains and their by-products are lacking in both quantity and quality of proteins, it is necessary to provide supplements which will make up this deficiency. The use of soybean meal for this purpose is growing but it is necessary that part of the additional protein come from animal sources. Supplements which are most used are milk products and by-products from the meat and fish packing industries.

(*a*) *Fishmeal.*—Fishmeal has gained in popularity as a protein supplement and the better grades rank among the most valuable high protein content feeds. The higher grades of fishmeal contain as much as 75 per cent protein and are also fairly rich in needed minerals and vitamins. Good quality fishmeals are desirable ingredients for all poultry mashes needing protein supplements. They usually contain several needed vitamins and are rich in mineral matter also.

(*b*) *Meat scrap* and *meat bone meal.*—These are by-products of the meat packing industry containing at least 50 per cent protein and are very desirable sources of animal protein for poultry of all ages. They are also rich in needed minerals. *Meat and bone scrap* and *meat and bone meal* are related products which contain a somewhat lower percentage of protein and a higher percentage of minerals.

(*c*) *Milk.*—Milk products are among the most desirable protein supplements for chickens of all ages and have a special value for young chicks and breeding stock during the hatching season. Skim-milk and buttermilk can be fed in the liquid, semi-solid or powdered form with equally good results. As a means of comparison, one pound of powdered milk is the equivalent of three pounds of semi-solid milk or nine to ten pounds of liquid milk. In addition to its protein content, milk contains the needed mineral elements calcium and phosphorus, vitamin A, riboflavin and some readily available carbohydrates.

3. Mineral feeds

The need of a high percentage of minerals in the diet of chickens has been pointed out in Lesson 8. In practical feeding, it is usually sufficient to supplement the amounts of calcium, phosphorus, manganese, and salt that are found in the ordinary grain feeds.

(*a*) *Marine shells.*—The shells of oysters, clams, quahaugs, and other marine life are the most common sources of supplementary calcium. These products are usually fed in a crushed state from small boxes or hoppers but when hens are laying very heavily it may be advisable to add some in ground form to the mash also. Marine shells have a high calcium content and dissolve fairly rapidly in the digestive systems of the birds.

(*b*) *Limestone grit.*—Limestone is similar in composition to marine shells and is used both as grit for poultry and to provide the birds' calcium requirements. What is called dolomitic limestone contains more or less of the element magnesium which is toxic to poultry. Poultrymen should be assured that limestone grit has a high calcium carbonate content to avoid the danger of magnesium being present. Limestone can be fed in the form of grit or finely ground and added to the mash.

(*c*) *Hard grit.*—Grit is fed to poultry to aid in grinding the food in the gizzard and not because it contains any needed mineral elements. Probably if oyster shell or limestone grit is always available to the birds, no other grit will be needed. Gravel of suitable size from a bank or the bed of a stream can be used when available. Commercial grits are crushed from granite and other relatively insoluble rock materials.

(*d*) *Bonemeal.*—Bonemeal is a by-product of the meat packing industry that contains about 25 per cent protein, 27 per cent calcium and 13 per cent phosphorus. These are all needed in poultry diets but since there are cheaper sources of protein and calcium, bonemeal is used primarily to add phosphorus and the need is greatest in the diets of growing chicks.

(*e*) *Salt.*—From one-half to one per cent of common salt is added to practically all poultry mashes to supply the birds' needs in sodium and chlorine and to make the feed palatable.

(*f*) *Manganese.*—This element is needed in very small amounts but is necessary for normal growth, bone development, egg production, and hatchability of eggs. Common feeds usually lack a sufficient amount and the shortage can be made up by adding one-quarter pound of powdered manganese sulphate to each ton of mash.

(*g*) *Charcoal.*—Hens eat charcoal with apparent relish and in the past it has been a common ingredient in poultry mashes. Recent experimental work has indicated that it has no beneficial effect on either chicks or adult stock.

(*h*) *Epsom salts.*—There has been a tendency on the part of poultrymen to dose their flocks at regular intervals with epsom salts. Such action seems warranted only when there is reason to believe that medicinal treatment is needed. Then the amount given should not be greater than three-quarters of a pound of salts to 100 mature birds. For a growing flock, the dosage is at the rate of three-quarters of a pound to 500 pounds live weight of chickens.

4. Green and succulent feeds

Green feeds are given to poultry because they contain needed vitamins and minerals. They consist of fresh green-leaved plants such as alfalfa, clover, and grass or the same products dried, dehydrated, or made into silage. The succulent feeds are low in nutrients, high in water content and are used principally because of their beneficial effect on the digestive tract.

(*a*) *Pasture.*—During the growing season, chicks and older birds on range will derive their green feed requirements from such pasture crops as alfalfa, clover, grass, cereal grains, and rape. Further reference has been made to a supply of such feeds in Lesson 7.

(*b*) *Dried* and *dehydrated green feed.*—Dried and dehydrated alfalfa, clover, and grass are very desirable forms of green feed for winter feeding. The dehydrated forms are preferred because when so cured there is less loss of vitamins than when these products are dried in the sun.

(*c*) *Silage.*—Silage made from alfalfa, clover, or grass is very palatable to poultry and is a desirable form of green feed when in good condition.

(*d*) *Garden crops.*—Swiss chard, kale, and the outer leaves of cabbage are satisfactory forms of green feed when available.

(*e*) *Roots.*—Mangels, beets, turnips, carrots, and potatoes are all used to some extent as succulent feeds. Of these, carrots are the most valuable because of their high vitamin A content.

(*f*) *Sprouted* and *germinated oats.*—To prepare these products, oats are first soaked and then held for varying periods in a warm room. With the former, the oats are spread out and held until the sprouts are two or three inches long before they are fed. With the latter, the oats are fed when the sprouts are about one inch long. Both products are relished by the birds but a warm room is necessary for their preparation and considerable work is entailed in their preparation. Because of these reasons, their use is not very general.

5. Vitamin feeds

The vitamin requirements of poultry have been explained at considerable length in the preceding lesson. Fortunately, most of the vitamins required by chickens are found in sufficient amounts in common poultry feeds. It is usually necessary for part of the year at least to provide additional amounts of vitamin A, vitamin D, and riboflavin.

Cod liver and other fish oils are rich sources of vitamins A and D. Most oils are now biologically tested and standardized as to their vitamin content. They are sold in various potencies and the amount used in any feed mixture will depend on the potency of the oil being used. Dehydrated alfalfa and milk products are the chief natural sources of riboflavin used for supplementing poultry diets. Synthetic riboflavin and vitamin D products have come into quite general use in recent years.

6. Feeding methods

There are four feeding methods common enough to require explanation, viz., grain feeding, mash feeding, pellet feeding, and cafeteria or free-choice feeding. The combination of grain and mash feeding is more generally practised than any one of these methods alone. With a few food products, special methods to suit the feeding stuff in question must be adopted. The manner in which the feed is placed before the birds may also be included among feeding methods.

(*a*) *Grain feeding.*—This is the feeding of a mixture of cracked or whole grains. It is an easy method of feeding and caters to the hens' preference for grain as compared with mash. Grain feeding alone is not practised much because no mixture of grains contains adequate amounts of proteins, minerals, and vitamins and the necessary supplements are not easily added to a grain mixture.

(*b*) *Mash feeding.*—It is easier to balance the nutrients in an all-mash diet than in grain feeding so all-mash feeding is quite common. It is used almost exclusively for starting chicks and for fattening and to a lesser extent during the growing period and for laying hens.

A much more common practice than grain feeding or mash feeding is a combination of the two. This plan makes it easily possible to regulate at will the proportions of protein and carbohydrates because mash feeds are usually higher in protein than grain mixtures.

(*c*) *Pellet feeding.*—This method is a modification of all-mash feeding. The mash is compressed into particles or pellets of a size that they can be swallowed easily. Pellets are palatable to the birds but their manufacture is an added expense.

(*d*) *Cafeteria* or *free-choice feeding.*—In following this method, the individual feed ingredients are placed in separate containers and the birds make their own selection. This plan of feeding is based on the belief that hens will balance their diet if given the opportunity to choose their own food. Cafeteria feeding is not a very practical plan for the feeding of farm or commercial flocks because of the work in keeping a large number of feeders filled but with almost any method of feeding, some materials, such as grit and shell are given by the cafeteria method.

From the results of experimental work in cafeteria feeding conducted at the Ontario Agricultural College, very satisfactory mixtures for all feeding purposes have been formulated.

(*e*) *Special feeding methods.*—Water, liquid, and semi-solid milk products, sprouted oats, roots, cut clover, grit, and shell are examples of feeding stuffs which are not usually incorporated in feed mixtures and which must have special consideration. Water is provided by automatic founts or in pails or other suitable containers. Stoneware or wooden containers are most satisfactory for liquid milk. Semi-solid milk products can be diluted and fed as liquid milk or pasted on the wall at a convenient height for the hens to pick at. Sprouted oats may be fed from V-shaped troughs. Roots are often split in halves and stuck on nails projecting from the walls at a height that the hens can pick at them readily. Cut clover can be fed from a hopper with the sides covered with wide mesh wire netting. Grit and shell are fed from small self-feeding hoppers.

(*f*) *Hopper feeding.*—The placing of feed in hoppers or feeders from which the hens can help themselves is termed hopper feeding. It is a labour saving plan and can be used for both grain and mash. Mash is usually fed dry but is sometimes moistened when it is desired to stimulate the appetites of the birds. Moist mash spoils readily so no more should be given than will be eaten up in a few minutes. The moist mash may be spread on top of the dry mash in the usual feeders or fed in V-shaped troughs.

(*g*) *Litter feeding.*—Grain is sometimes scattered in the floor litter with the belief that the hens get valuable exercise in their search for it. It is not a sanitary method of feeding and the practice of feeding grain from feeders and troughs is growing.

7. Management

There are a few factors of management in poultry feeding which are often overlooked that have an important bearing on whether or not the best results are obtained. These include regularity in feeding, care in changing from one feed mixture to another, the caretaker's movements within the poultry house and sanitation.

(*a*) *Regularity in feeding.*—Hens become accustomed to regular hours of feeding and are restless and discontented if the routine is interrupted. Food and water should be supplied regularly.

(*b*) *Changes in diet.*—It is sometimes necessary to change from one feed mixture to another and, when this is done, the egg production of the hens will be disturbed less if the change is made gradually.

(*c*) *Movements within the poultry house.*—Hens are less disturbed when the caretaker moves quietly among them. Some poultrymen knock on the door of each pen before entering. This practice prepares the birds for the opening of the door which, if done without warning, may easily frighten them.

(*d*) *Sanitation.*—Both feed and water containers should be so built that floor litter is not easily scratched into them and the entrance of droppings is not possible.

8. Formulating feed mixtures

The principles of poultry feeding have been explained in Lesson 8 and this lesson describes the ingredients most commonly used in poultry diets. We must now consider the details of formulating feed mixtures for various purposes. Analyses of all ingredients used are necessary if a feed mixture is to be completely balanced. This is seldom possible and, for practical purposes, the recommendations of agricultural colleges, experimental farms, and departments of agriculture will be found useful guides in preparing feed mixtures. Those issued by local institutions are usually more suitable than the recommendations from districts having entirely different climatic conditions.

Grains and their by-products will make up the greatest bulk of feed mixtures but it is very important that protein, mineral, and vitamin supplements be added as required. Water must be provided and the fibre content should be kept low.

(*a*) *Energy requirements.*—The birds' energy requirements are met by having from 75 to 85 per cent of the diet made up of grains and grain by-products. Three or four ingredients should be used to provide variety.

(*b*) *Protein.*—Diets for chicks should contain about 20 per cent protein and those for laying and breeding stock about 15 per cent. The requirements for chicks vary somewhat being about 20 per cent for the first six weeks and diminishing gradually to about 14 per cent as the birds approach maturity. To attain these percentages, protein supplements are added to the other mash ingredients to the extent of 10 to 20 per cent of the total. Since proteins vary greatly in quality, some care must be taken in the selection of supplements but requirements will usually be met if at least one-quarter of the protein supplement is derived from animal sources. A combination of two or more ingredients that are rich in protein is preferable to one. Milk products are especially desirable during the hatching season and can be used throughout the year when prices are favourable. The protein content of fattening diets is less important than those fed to chicks and laying hens but usually they contain from 12 to 14 per cent.

(*c*) *Minerals.*—Oyster shell or limestone grit should be kept before the flock at all times to provide calcium. If the mash does not contain meat scrap, fishmeal, or other product that contains considerable calcium, it is also advisable to add about one and one-half pounds of ground oyster shell or limestone to each 100 pounds of mash. From one-half to one pound of salt should be added to each 100 pounds of mash and for young chicks, one-quarter pound of manganese sulphate to each ton of mash.

(*d*) *Vitamins.*—The need of vitamin supplements varies greatly with conditions and is least when the birds are on range of good quality. Under such conditions, neither fish oil nor dried green feeds are needed. When the birds are enclosed, fish oil should be added according to the degree of confinement and the concentration of vitamins in the oil used. Similarly when the birds are enclosed, from 5 to 7 per cent dried green feed should be added and this amount should be increased to 10 per cent when there is no yellow corn in the diet.

(*e*) *Water.*—Hens require a continuous supply of clean, fresh water.

(*f*) *Fibre.*—Fibre is mainly indigestible material and there is seldom too little in the diet. The usual range is from 5 to 10 per cent and care should be taken that the latter figure is not exceeded.

LESSON 10

FEED MIXTURES

Topics for Study

1. Mixtures for starting chicks.
2. Mixtures for feeding broilers.
3. Mixtures for growing or developing chicks.
4. Mixtures for laying flocks.
5. Mixtures for breeding flocks.
6. Mixtures for fattening poultry.
7. University of British Columbia "Foundation" formula.

The large Canadian milling companies prepare and sell poultry feeds for all feeding purposes. These are widely used and give general satisfaction. They should be fed according to the manufacturer's directions to ensure the birds receiving all nutrients in proper amounts. Where both grain and mash are recommended, it is important that both should be used and in the proportions advised by the manufacturer.

Some poultrymen prefer to mix their own feeds and it is for their benefit that this lesson is included. There is no recognized "best" mixture for any feeding purpose. Satisfactory results can be secured from widely different mixtures provided they supply the necessary nutrients in proper proportions. This makes it possible to vary the diet according to the quality, availability, and cost of ingredients. The amount of variation which can take place is clearly shown in the University of British Columbia "Foundation" formula given in Section 7 of this lesson.

Knowledge regarding poultry nutrition is increasing rapidly and the person who mixes his own feed should be sure he is following the most recent recommendations of the institution whose formula he adopts.

In addition to formulae such as those listed in this lesson, there is also the plan of buying a prepared "concentrate", which contains protein, mineral, and vitamin supplements, which is added to ground cereal grains. Where this plan is followed, the proportion of "concentrate" to ground grains should be strictly according to the manufacturer's directions.

For the sake of uniformity, the formulae which follow are for ton lots of feed although it is recognized that in many cases it is advisable to mix smaller quantities.

1. Mixtures for starting chicks

(*a*) *Central Experimental Farm formula.*

MASH MIXTURE

800 lb.	wheat (coarsely ground)
300 lb.	oats (finely ground)
200 lb.	wheat middlings
200 lb.	wheat shorts
60 lb.	fishmeal (60 per cent protein)
40 lb.	meat meal (50 per cent protein)
245 lb.	soybean meal
100 lb.	dried green feed
20 lb.	bonemeal
20 lb.	ground limestone
10 lb.	salt (iodized)
5 lb.	fish oil (1,500 A, 200 D
1 gram	synthetic riboflavin

Mixing.—The mixing of the small quantities in the above ration is difficult since it is essential to have them thoroughly distributed throughout the whole mixture. The fish oil should be added to about half a pail of shorts or soybean meal and mixed thoroughly by hand. Keep on adding more and more of the dry feed until the oil is well absorbed. This can then be added to a larger quantity and so on until thorough distribution throughout the whole mash is achieved. In the case of riboflavin, the one gram should be mixed thoroughly by hand in about a cupful of middlings or soybean meal until thoroughly distributed as indicated by a uniform yellow colour throughout the mixture, this mixed with a larger quantity and so on until the quantity is sufficient to safely attempt to mix with the bulk of the mash mixture.

Substitution.—It will often happen that one or other of the ingredients in the starter mash shown is not available. Substitutes may be used in such a case but only with the greatest care. Corn or barley may be used in place of wheat or oats, for example, but it should be remembered in the case of corn that it is lower in protein by approximately two to three per cent than wheat. Fishmeals of 70 per cent protein or more may be available and, if used, the extra protein must be offset by using less of this fishmeal and increasing the proportion of some lower protein ingredients such as the grains. Either fishmeal or meat meal may be changed in proportion according to availability, always of course adjusting to arrive at the same protein level as the original mash. Soybean meal, however, should not be increased in proportion and should always be used with meat meal or preferably fishmeal as it is not a satisfactory substitute for all of the animal feeds. The quantities of the remaining ingredients should not be varied except by those quite familiar with methods of balancing vitamins and minerals in rations.

Regarding dried green feeds, they are of greatly varying quality. The best are the artificially dehydrated green feeds such as the grass meals and alfalfa leaf meals. From such meals they range downward to ordinary alfalfa meals from sun-dried hay. The value of these latter types of product depend upon how quickly and carefully it has been field cured and upon the proportion of stems in the mixture. Their value as poultry feeds is roughly proportionate to the intensity of their green coloration. A bleached green feed is of very little value to poultry.

If 400D fish oil is used, only one-half the quantity is required.

The principles of substitution just elaborated apply equally to other mashes.

Feeding directions.—The starter mash shown should be fed alone until the chicks are six to eight weeks of age. If desired it may be fed during the rearing period as well, rather than mixing a special growing mash and this should be done if the birds are confined to the house or if their range is deficient in fresh green forage. If so fed, after six weeks a small quantity of scratch grain is given and the quantity is gradually increased throughout the rearing period until three times as much grain as mash is consumed as maturity approaches.

(*b*) *Ontario Agricultural College formula.*

MASH MIXTURE

400 lb. ground yellow corn
200 lb. wheat bran
200 lb. wheat shorts
200 lb. ground wheat
200 lb. rolled oat groats
200 lb. ground whole oats
110 lb. ground barley
50 lb. dehydrated alfalfa
20 lb. dehydrated cereal grass
150 lb. soybean oil meal (41 per cent protein)
60 lb. meat meal (50 per cent protein)
100 lb. fish meal (65 per cent protein)
25 lb. buttermilk powder
40 lb. ground limestone or oyster shell
20 lb. insoluble grit
10 lb. bonemeal
10 lb. salt (iodized)
5 lb. fish oil (2,400 A, 400D)
4 oz. technical grade anhydrous manganese sulphate
1·5 grams riboflavin

GRAIN MIXTURE

See Section 3(*b*). The grain must be of a size suitable for the age of the chicks.

Substitution.—See Section 3(*b*).

Feeding directions.—No grain or extra minerals should be fed during the first six weeks. After this time, begin to feed grain and insoluble grit, increasing the amount of grain gradually as the birds grow. For early-hatched chicks which must be kept indoors for a long period, the use of this mash plus grain is recommended until such time as the birds go to range. For birds three to four months of age and still indoors, considerable grain feeding is possible. At no time, however, should growing birds indoors be allowed to consume more grain than the amount of mash being taken, and when grain consumption reaches one-third of the total feed consumption, extra limestone or oyster shell should be given in addition to the insoluble grit. For later-hatched birds, in which case they would be moved to range at an earlier age, it is recommended that the use of growing mash be started considerably sooner. If the range is good, the growing mash is satisfactory as soon as the birds are eating pasture readily. The change from starting mash to growing mash should be gradual.

(*c*) *University of Saskatchewan formula.*

MASH MIXTURE

680 lb.	wheat chop
480 lb.	oat groats or hulled oats
200 lb.	barley chop
100 lb.	bran
100 lb.	fishmeal (68 per cent protein)
140 lb.	meat meal (55 per cent protein)
60 lb.	milk powder
200 lb.	alfalfa meal
10 lb.	ground limestone
10 lb.	bonemeal
10 lb.	salt
10 lb.	fish oil (1,500A, 200D)
4 oz.	manganese sulphate

Substitution.—This all-mash mixture may be modified if there is an ample supply of skim-milk (either sweet or sour) available at all times. The milk powder may be eliminated and the fishmeal and meat meal reduced by half. Where this is done, the grain chop may be increased by a corresponding amount. If neither oat groats or hulled oats is available, oat chop with the hulls sifted out may be used instead.

Feeding directions.—The amount of feed required during the brooding season will vary according to the breed, sex, and time of hatching. A good rule to follow is to provide 200 pounds of chick starter for each 100 chicks. This will last for five or six weeks after which a growing or developing mash should be fed. At no time should the birds be without feed but the hoppers should not be overfilled because this will result in waste. It is best to add fresh feed each day because it will then be less dusty and more palatable.

2. Mixtures for feeding broilers

The starting mashes given in Section 1 are quite satisfactory for the raising of broilers. In some cases starting mashes are fed throughout the entire period while in others a change is made to a fattening mash two or three weeks before the birds are to be killed. No grain is fed. See Section 6 for details of fattening mashes.

3. Mixtures for growing or developing chicks

(*a*) *Central Experimental Farm formula.*

MASH MIXTURE

900 lb.	wheat (coarsely ground)
300 lb.	oats (ground)
500 lb.	barley (ground)
140 lb.	soybean meal
60 lb.	fishmeal (60 per cent protein)
40 lb.	meat meal (50 per cent protein)
20 lb.	bonemeal
20 lb.	ground limestone
20 lb.	salt (iodized)

Substitution.—See Section 1(*a*).

Feeding directions.—The chicks are gradually changed from the starting mash to the growing mash at from six to eight weeks of age. A mixture of whole wheat and other whole or cracked grains is also fed. Both grain and mash are kept before the birds in troughs throughout the growing period. Good green pasture is essential with this mixture.

(*b*) *Ontario Agricultural College formula.*

MASH MIXTURE

200 lb.	ground yellow corn
250 lb.	wheat bran
250 lb.	wheat shorts
300 lb.	rolled wheat
400 lb.	ground whole oats
217 lb.	rolled barley
30 lb.	dehydrated alfalfa
10 lb.	dehydrated cereal grass
100 lb.	soybean oilmeal (41 per cent protein)
80 lb.	meat meal (50 per cent protein)
90 lb.	fishmeal (65 per cent protein)
40 lb.	ground limestone or oyster shell
10 lb.	bonemeal
20 lb.	salt (iodized)
3 lb.	fish oil (2,400A, 400D)
6 oz.	technical grade anhydrous manganese sulphate
.5 grams	riboflavin

GRAIN MIXTURE

666 lb.	oats
666 lb.	wheat
334 lb.	barley
334 lb.	cracked corn

Substitution.—Many substitutions are possible in the above mash depending upon price and availability. The amount of animal protein may be reduced considerably and soybean oilmeal or other suitable vegetable protein concentrate increased to maintain the protein level. When this is done, however, adjustment upwards of the calcium and phosphorus is also required. Part or all of the corn may be replaced by other cereal grains in this mash without the necessity of adding extra vitamin A. Where corn is readily available, however, it is highly recommended. Corn imparts a desirable physical consistency to the feed and is highly digestible and palatable.

The grain mixture will depend upon conditions of local availability. It is desirable to have at least three cereal grains in any mixture. Each grain has certain advantages and by using a combination it is possible to profit through all of them. On the other hand, no single grain is absolutely indispensable in the poultry feeding program.

Feeding directions.—This formula will give good results when birds are on range. While it contains some green feed and fish oil there is insufficient of these materials for use on poor or dried-up pasture. On good pasture, it is recommended that restricted feeding be practised and grain may constitute a greater proportion of the total feed consumed than mash during the latter stages of growth. On certain types of soil, it is necessary to feed extra calcium in the form of oyster shell or limestone, and extra insoluble grit. Where plenty of these materials are naturally available, none need be supplied. A considerable proportion of oats in the grain mixture is desirable during the growing period and grit in this case is an important factor.

In addition to the regular grain mixture given, it is considered advantageous by many poultry raisers to feed oats alone as a regular part of the range feeding program. A feed of oats each day in addition to the feedings of regular grain mixture and mash is considered an excellent practice.

4. Mixtures for laying flocks

(*a*) *Dominion Experimental Farm formula.*

MASH MIXTURE

800 lb.	wheat (coarsely ground)
300 lb.	oats (ground)
150 lb.	barley (ground)
100 lb.	wheat bran
100 lb.	wheat middlings
60 lb.	fishmeal (60 per cent protein)
60 lb.	meat meal (50 per cent protein)
200 lb.	soybean meal
100 lb.	dried green feed
50 lb.	bonemeal
40 lb.	ground limestone
20 lb.	salt (iodized)
20 lb.	fish oil (1,500A, 200D)
¼ lb.	manganese sulphate
1 gram	synthetic riboflavin

GRAIN MIXTURE

Because the feeding value of the common grains is fairly similar, a great deal of latitude in the proportion of grains in the mixture can be allowed. Wheat usually makes up the greatest proportion of the mixture with oats and barley in lesser quantities. Corn is often fed in a small proportion, when available, and should be cracked.

Substitution.—See Section 1(*a*).

Feeding directions.—The mash is kept before the birds in hoppers so that they can help themselves at all times. Grain is fed separately, usually in the litter in such quantities that mash and grain are eaten in equal amounts. Oyster shell or hen-size high calcium content limestone (95 per cent or better calcium carbonate) is always available to the birds in hoppers during the laying period.

(*b*) *Ontario Agricultural College formula.*

MASH MIXTURE

300 lb.	ground yellow corn
175 lb.	wheat bran
100 lb.	wheat shorts
150 lb.	ground wheat
100 lb.	rolled wheat
250 lb.	ground whole oats
200 lb.	rolled whole oats
150 lb.	ground barley
80 lb.	dehydrated alfalfa
40 lb.	dehydrated cereal grass
160 lb.	soybean oilmeal (41 per cent protein)
70 lb.	meat meal (50 per cent protein)
135 lb.	fishmeal (65 per cent protein)
40 lb.	ground limestone or oyster shell
20 lb.	bonemeal
20 lb.	salt (iodized)
10 lb.	fish oil (2,400A, 400D)
8 oz.	technical grade anhydrous manganese sulphate
1·5 grams	riboflavin

GRAIN MIXTURE

666 lb.	oats
666 lb.	wheat
334 lb.	barley
334 lb.	corn

Substitution.—See Section 3(*b*).

Feeding directions.—The mash is designed to be fed with an equal amount of grain. If both are fed free choice, the tendency will be for the birds to consume too high a proportion of grain. It is therefore recommended that mash be kept before the birds at all times and the amount of grain be limited. Oyster shell or limestone and insoluble grit should be fed free choice with this formula.

(*c*) *University of Saskatchewan formula.*

MASH MIXTURE

560 lb.	wheat chop
400 lb.	oat chop
330 lb.	barley chop
100 lb.	wheat bran
100 lb.	fishmeal (68-70 per cent protein)
140 lb.	meat meal (55 per cent protein)
60 lb.	skim-milk or buttermilk powder
200 lb.	alfalfa meal (good quality)
20 lb.	steamed bonemeal
60 lb.	ground limestone
10 lb.	salt
20 lb.	fish oil (1,500A, 200D)
4 oz.	manganese sulphate (feed grade)

GRAIN MIXTURE

1,000 lb.	wheat
500 lb.	oats
500 lb.	barley

Mixing.—The required amounts of chopped grains, protein concentrates and alfalfa meal are weighed out and placed in a pile on the mixing floor. The bonemeal, limestone, salt, and manganese sulphate are carefully mixed together and sprinkled over the pile of chopped grains. The oil is added to the bran and mixed carefully by hand until all the bran has an oily consistency. It may be necessary to add a little of the other feeds to blot up the oil to the point that the bran can be put through a screen of one-quarter-inch mesh. After sifting, the bran is sprinkled over the original pile as evenly as possible and the whole mixture is shovelled over four or five times or until the individual ingredients cannot be distinguished.

The amount of mash to mix at one time will depend upon the size of the flock. A mixing once a week is more satisfactory than one mixing a month—the feed will be fresher and more palatable. One hundred pounds of mash will last 100 layers from seven to eight days, depending upon the breed, time of year and rate of production.

Substitution.—The proportion of the various grains to be used in the grain mixture does not make any appreciable difference provided more than one grain is fed. The usual recommendation is that one-half the total mixture should be wheat. A satisfactory mixture is one-half wheat, one-quarter oats and one-quarter barley. Proportions may be either by measure or weight. A common mixture for the warmer months is two-thirds wheat and one-third oats. Barley is added as an additional source of heat during the winter months.

Feeding directions.—After the pullets have been transferred to winter laying quarters and have become accustomed to their surroundings, a gradual change should be made from the growing mash to the laying mash. In addition to the regular feeding it is advisable to feed a forkful of alfalfa or oat sheaves in a rack for a period of 10 to 14 days even though there is sufficient green feed in the dry mash mixture. The pullets have been receiving a more fibrous diet on range and have been leading a more active life. The feeding of extra alfalfa or oat sheaves will help the birds become accustomed to their restricted quarters. The feeding of additional green feed at this time will materially aid in preventing outbreaks of feather pulling.

Dry mash should be in front of the birds at all times in open hoppers. One hundred pullets will consume from 12 to 15 pounds daily depending on the breed, rate of production, and season of the year. Do not over-fill the hoppers and do not refill until they are empty since otherwise there will be an accumulation of stale, dusty feed in the bottom.

The birds will consume more grain than is required if given the opportunity and over-feeding may result in the laying of thin or soft-shelled eggs, heavy accumulation of fat in the abdomen, lowered production, and often such vicious habits as egg eating and cannibalism. Do not feed more than 12 or 15 pounds of grain mixture daily, giving approximately one-third of the total in the morning and the remaining two-thirds just before dark where artificial lights are not used.

5. Mixtures for breeding flocks

(a) Central Experimental Farm formula.

MASH MIXTURE

800 lb.	wheat (coarsely ground)
200 lb.	oats (ground)
300 lb.	barley (ground)
100 lb.	wheat bran
100 lb.	wheat middlings
100 lb.	fishmeal (60 per cent protein)
90 lb.	meat meal (50 per cent protein)
100 lb.	soybean meal
100 lb.	dried green feed
10 lb.	dried yeast
40 lb.	bonemeal
20 lb.	ground limestone
20 lb.	salt (iodized)
20 lb.	fish oil (1,500A, 200D)
2 grams	synthetic riboflavin

GRAIN MIXTURE

The same as for laying flocks. See Section 4(*a*).

Mixing.—See Section 1(*a*).

Substitution.—If yeast is not available, the meat or fishmeal may be increased accordingly but the mash is considered to be more satisfactory if yeast is included. See Section 1(*a*) but bear in mind that less substitution of animal proteins is possible here than in the starting, growing, and laying mashes.

Feeding directions.—The mash for breeding flocks is fed exactly as the mash for laying flocks with equal parts of mash and grain. (See Section 4(*a*)). It should replace the laying mash at least six weeks before eggs are to be saved for incubation.

(*b*) *Ontario Agricultural College formula.*

MASH MIXTURE

400 lb.	ground yellow corn
175 lb.	wheat bran
100 lb.	wheat shorts
100 lb.	ground wheat
100 lb.	rolled wheat
200 lb.	ground whole oats
200 lb.	rolled whole oats
133 lb.	ground barley
80 lb.	dehydrated alfalfa
40 lb.	dehydrated cereal grass
160 lb.	soybean oilmeal (41 per cent protein)
70 lb.	meat meal (50 per cent protein)
120 lb.	fishmeal (65 per cent protein)
30 lb.	buttermilk powder
40 lb.	ground limestone or oyster shell
20 lb.	bonemeal
20 lb.	salt (iodized)
12 lb.	fish oil (2,400A, 400D)
8 oz.	technical grade anhydrous manganese sulphate
2·5 grams	riboflavin

GRAIN MIXTURE

The same as for laying flocks. See Section 4(*b*).

Substitution.—See Section 3(*b*) but keep in mind that there should be no substitution of animal protein supplements in mashes for breeding flocks.

Feeding directions.—The same as for laying flocks. See Section 4(*b*).

(*c*) *University of Saskatchewan formula.*

MASH MIXTURE

500 lb.	wheat chop
400 lb.	oat chop
280 lb.	barley chop
100 lb.	wheat bran
100 lb.	fishmeal (68-70 per cent protein)
140 lb.	meat meal (55 per cent protein)
160 lb.	skim-milk or buttermilk powder
200 lb.	alfalfa meal (good quality)
20 lb.	steamed bonemeal
60 lb.	ground limestone
10 lb.	salt
30 lb.	fish oil (1,500A, 200D)
4 oz.	manganese sulphate (feed grade)

GRAIN MIXTURE

1,000 lb.	wheat
500 lb.	oats
500 lb.	barley

Feeding directions.—The general feeding plan is the same as for laying flocks and is given in section 4(*c*). The breeding mash contains more vitamins than the laying mash and the change from the latter to the former should be made at least four weeks before eggs are to be saved for incubation. In the majority of flocks, the change from a laying to a breeding mash should be made early in January. Money will be saved by reverting to the laying mash as soon as eggs are no longer needed for hatching.

6. Mixtures for fattening poultry

(*a*) *Central Experimental Farm formula.*

MASH MIXTURE

1,000 lb.	ground oat groats
500 lb.	ground wheat
300 lb.	ground buckwheat
200 lb.	meat meal

Feeding directions.—If oat groats or hulless oats are not available, ground whole oats from which as much of the hull has been sifted as possible, should be used. All grains should be ground from medium fine to fine in granulation. The above mash should usually be fed for two weeks if the birds are in fattening crates and for three weeks if in pens. The mash should be fed mixed with skim-milk, buttermilk, or unwatered whey to a consistency which will just pour, twice daily. All unconsumed feed should be removed after one-half hour of feeding and be fed to other stock. Water should be available to drink between feedings.

(*b*) *Ontario Agricultural College formula.*

MASH MIXTURE

500 lb. white corn hominy
400 lb. ground wheat
300 lb. ground oat groats
100 lb. buttermilk powder
20 lb. ground limestone or oyster shell
240 lb. ground whole oats
300 lb. ground barley
120 lb. meat meal (50 per cent protein)
10 lb. bonemeal
10 lb. salt (iodized)

Feeding directions.—This mash is designed for fattening mature or nearly mature birds and should be fed as an all-mash ration. It should be moistened with water or milk to the consistency of a thick gruel and fed two or three times daily in amounts which the birds will clean up readily in about twenty minutes. Clean out the troughs after this time. It is important not to over-feed. Water should be supplied free choice during the fattening period, which should not exceed two weeks for closely confined birds.

7. University of British Columbia "Foundation" formula

In bulletin No. 107 of the British Columbia Department of Agriculture is given a "foundation" formula for chick starting, developing, laying, and breeders' mashes that will serve as a useful guide to poultrymen in preparing feed mixtures. The formula, which follows, shows the maximum and minimum percentages of the commonly used feed ingredients which can be included without seriously altering the efficiency of each mash mixture.

A "FOUNDATION" FORMULA FOR CHICK, DEVELOPING, LAYING, AND BREEDERS' MASHES

Chick Mash	Developing Mash (Free Range)	Laying Mash	Breeders' Mash	Ingredients	Range
lb.	lb.	lb.	lb.		
42	39	25	30	Wheat (coarsely ground) Barley Corn[1]	10–60% according to price. 10–25% according to price and quality. 10–25% according to price.
10	20	20	20	Oats	10–20% according to price and quality.
10	10	10	10	Wheat bran	5–20% according to price.
10	10	10	10	Wheat middlings or shorts	5–20% according to price.
....	....	5	....	Rice	0–10% according to price, quality, and availability.
10	8	10	10	Fishmeal	5–10% according to quality and price.
5	5	5	5	Meat meal	5–10% according to quality and price.
5	....	....	5	Dried skim-milk[2]	0–7·5% according to price.
....	....	5	....	Soybean meal	0–25% according to price and availability.
5	5	5	5	Dehydrated green feed[3]	5–10% according to quality.
1	1	2	2	Limestone or oyster shell	1–2½%.
....	1	....	....	Bonemeal or defluorinated rock phosphate	0–1%.
1	1	1	1	Salt, common or iodized[4]	½–1%.
1	....	2	2	Fish oil (1,000A, 100D units per gram)[5]	According to season and guaranteed vitamin content.
100	100	100	100		

[1] If yellow corn is available and compares favourably in price with wheat, oats, and barley, it may be included as part of the ration. During the war years the use of more wheat and more oats in place of corn gave high egg production and hatchability, better feathering, and greater freedom from cannibalism and prolapse.

[2] If dried skim-milk is not available, then at least 1 gram of synthetic riboflavin per ton of mash should be added. Otherwise, riboflavin mixtures or by-products of fermenting and distilling industries may be used. The amounts of these products to be included in a ration will depend upon their specified vitamin potencies.

[3] If not obtainable, increase the amount of fish oil and use a fermentation by-product of a high riboflavin content.

[4] Manganese sulphate at the rate of 4 to 8 oz. per ton should be thoroughly premixed with the salt.

[5] If fish oils of higher potency or vitamin D_3 powder are used, the amount of fish oil should be reduced proportionately and replaced with ground grains.

Directions for using "Foundation" formula.—Adjustments and changes in compounding rations for different purposes can be made according to quality, availability, and price of feeds, as shown in the "Foundation" formula. Within the pattern shown in the table many adaptions and substitutions may be made to meet peculiar conditions.

The bulk of the ration is made up of grain and grain by-products—corn, wheat, oats and barley. These may be interchanged provided that at least two ground grains and at least one by-product is included in the mash mixture. Additional variety of grains may be provided with the scratch mixture. The latter should consist of at least two and, if possible, three grains.

The amount of protein to be included in the ration will vary with the class of stock fed, purpose, and method of feeding. If both scratch and mash are fed it is important to bear in mind the total weights of each fed per day. Most laying mashes are formulated on the assumption that approximately equal parts by weight of scratch mixture and mash are fed. The scratch mixtures that are in common use contain, on the average, 10 to 12 per cent protein. Mash mixtures to which no animal or vegetable concentrates have been added contain, on the whole, about 1 to 2 per cent more protein than the scratch mixture. By the addition of such animal concentrates as fish, meat, and milk, or vegetable concentrates, as soybean meal, the total protein content of the mash may be raised from 10 to 12 per cent, as may be desired. Naturally, if an all-mash ration is fed, less animal protein would have to be added than when both mash and scratch are fed. The amount of protein supplied in the total ration can be varied by either increasing or decreasing the animal protein content of the mash or by varying the proportion of mash and scratch fed. In view of the fact that mashes contain, besides protein, certain ingredients which cannot be supplied conveniently either by themselves or with the scratch grain, it is advisable to mix moderately concentrated mashes, and aim at feeding approximately equal quantities of scratch and grain. Results obtained from feeding laying birds on all-mash rations have not, on the whole, been so consistent as on a scratch and mash ration.

The demand of growing chicks for proteins are very large. While it is not desirable to "force" chicks, a fairly rapid rate of growth is considered to be advantageous. For the first 6 weeks, the protein content of the ration should be about 20 per cent; from 7 to 12 weeks, about 18 per cent; from 13 to 18 weeks, 16 per cent; after which it should be reduced to about 15 per cent, and at the time the pullets come into production the protein content of the mash may be gradually increased to about 20 per cent. According to experiments conducted at the Washington State College, an all-mash laying ration containing 15 per cent of protein of good quality is adequate for satisfactory egg production. This would mean that when mash and scratch are fed in equal parts, there should be at least 20 per cent of protein in the mash. Hard Western Canadian wheat, of course, runs somewhat higher in protein than the soft wheats of the Interior of British Columbia and of the State of Washington. On this account, somewhat less animal protein is required to be added to mashes when the bulk of the scratch mixture consists of hard wheat.

The essential minerals used in supplementing mashes—calcium and phosphorus—are supplied by lime or marine shells, and the bone found in meat and fish meals. Additional amounts of phosphorus may be provided through bonemeal. When 10 per cent or more of the ration consists of meat and fish, there may be no need for additional phosphorus. If pullets on range eat more grain than mash, it may be advisable to add 1 per cent of bonemeal to the mash to increase the relative amount of phosphorus in the ration. Additional calcium in the form of oyster- or clam-shell may be supplied in self-feeding hoppers. Some investigators are of the opinion that no additional lime needs to be supplied to growing chicks over and above that already found in the developing mashes. It is thought by some that an excess of calcium may be detrimental to the well-being of growing pullets. In the case of laying birds, calcium should always be made available in self-feeding hoppers.

The important thing, of course, to remember in connection with the supply of calcium and phosphorus, particularly in the case of growing chicks, is that both the relative and absolute amounts of these two minerals must be supplied in correct proportions (and amounts). At the same time, it is essential that an adequate and continuous supply of vitamin D should be provided either in the form of fish oils, D_3 powder, or through exposure to direct sunshine.

If vegetable protein concentrates, such as soybean meal, are used as a substitute for a part of the animal proteins, it will be necessary to add bonemeal to the mash to compensate for the lack of minerals in the soybean.

Most rations are supplemented with 1 per cent of salt, although half this amount is probably sufficient with ordinary rations. Price permitting, iodized salt may be used in preference to common salt.

LESSON 11

BREEDING, SELECTING AND MATING POULTRY

Topics for Study

1. The breeder's objective.
2. Trapnesting.
3. Pedigree breeding.
4. Progeny testing.
5. Who should practise pedigree breeding?
6. Breeding systems.
7. Sex determination.
8. Selection of breeders.
9. Management of breeding stock.
10. Mating.

Early in the present century, before there was a commercial poultry business and when practically all purebred poultry was raised as a hobby by fanciers, interest in poultry breeding and selection was much more general than it is today. Every fancier was anxious to improve the excellence of his flock. Under present day conditions, interest in poultry breeding is limited mainly to those who have their flocks entered in Record of Performance, the few who now breed fancy poultry, and the still smaller number who are attempting to introduce new breeds. The majority of those who raise poultry for profit buy their chicks from hatcheries and do no breeding on their premises. Operators of "Breeder" hatcheries own and mate flocks to supply the eggs they need for hatching but "Commercial" hatcheries, which, in general, have the largest capacities are often operated by persons who do not own any poultry.

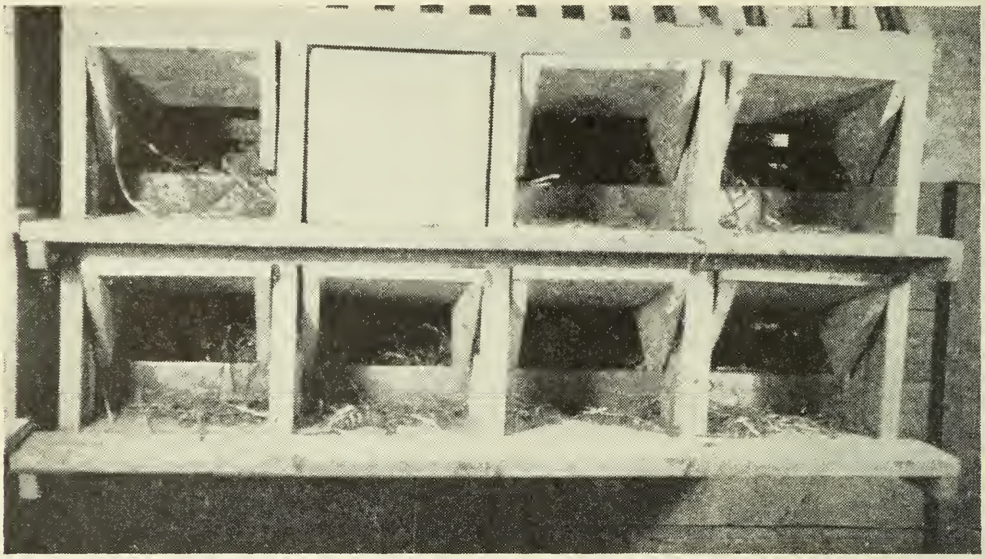
The development of new breeds is an undertaking for institutions which have financial backing and can employ a geneticist to direct the work. The breeding of fancy poultry calls for a detailed knowledge of the variety or varieties chosen and the needed information on varieties is too extensive to be considered here. This lesson is designed to include some of the elementary principles of breeding poultry for egg and meat production and the generally accepted rules regarding matings.

1. The breeder's objective

Such characteristics as high fertility and hatchability, rapid rate of growth and feathering, livability, meat type, high egg production, early sexual maturity, intensity and persistency of production, absence of pauses in production, freedom from broodiness, standard egg size and shape, uniform shell colour, good shell finish, resistant shell, thick albumen, freedom from blood and meat spots as well as freedom from *Standard* defects and disqualifications are all desirable characteristics known to be inherited. The aim of the breeder should be to strive, through selection and mating, towards the improvement of these desirable qualities and the elimination of those that are undesirable. This is a difficult and complicated problem because, while there is a tendency for offspring to resemble parents, a great deal of variation exists and progress is necessarily slow. Really skilful breeders of poultry are exceedingly rare.

2. Trapnesting

Trapnesting is done by specialized poultry breeders to secure individual egg records and other information regarding the hens in their flocks. At present, trapnesting is done mainly by entrants in Record of Performance, under Canada's National Poultry Breeding Program.



BATTERY OF TRAPNESTS

The door of the nest closes automatically as the hen enters and she must be released by the attendant.

Trapnests have doors which close as the hens enter and keep the birds within until they are released by the attendant. Each hen is identified by means of a numbered, metal leg band. When a hen which has laid is released from the nest, her leg band number is marked on the egg and later is entered on a form printed specially for this purpose. Such a form will usually contain the production figures for 50 hens for a period of one month. A season's accumulation of such records will give not only the individual egg records of the hens in the flock but much other valuable information such as the dates when production began, a record of broody spells or other pauses in production, the length of each hen's laying season, and the rate of production during this season. Trapnesting also makes it possible to keep a record of each hen's egg size, egg shape, colour and texture of shell, fertility, and hatchability. Trapnesting may be limited to five days a week and the individual records may be converted to a seven-day basis at the end of the record year. Limited trapnesting is as accurate as full-time trapnesting especially with respect to family averages.

3. Pedigree breeding

Pedigree breeding is the practical application of the information gleaned by trapnesting to the improvement of the flock by the matings made. Just before hatching time, the eggs of individual hens are placed in separate bags or baskets so that, on hatching, they can be identified with numbered tags or wing bands and a record kept of their parentage. The procedure of trapnesting, breeding the most desirable individuals as proved by trapnest records and keeping records of their progeny, goes on year after year until a mass of record material accumulates. Pedigree breeding requires the keeping of a fairly complicated system of records.

4. Progeny testing

While there is a tendency for chicks to resemble their parents in many respects, they are sometimes widely different in their characteristics. Thus it is a common event to find that none of the daughters of a high-producing hen equals the dam's egg record. Progress in poultry breeding is slow when the egg records of individual hens is the only consideration in making matings. Geneticists agree, and practical results support their theory, that selection based on progeny and family testing will produce more effective results.

PEDIGREED CHICK

The numbered, metal band sealed in the web of the wing is used as a permanent identification of the chick's breeding.

A progeny-tested individual is one which has produced progeny that are appreciably better than average in respect to the characteristics desired. A progeny-tested male, with respect to egg production, for instance, is one which when mated to a pen of females, produces daughters which are exceptionally good layers of standard sized eggs. Likewise, a progeny-tested female is one which always produces daughters which are better than average layers of standard sized eggs. An individual, the excellence of which is proved by progeny test, is termed a preponent individual.

An ideal mating is a prepotent male with prepotent females but in practice this is not generally possible because of the rarity of prepotent individuals. The mating together of the progeny of prepotent individuals is highly desirable but the breeder is limited in his efforts along this line by the scarcity of such birds. A third procedure and one which can be more generally undertaken is the segregation and mating together of sister-tested birds. Such birds are from families of which all female members have been exceptionally good layers. This family method of breeding is preferable to selection on the basis of individual egg records alone.

5. Who should practise pedigree breeding?

Trapnesting and the keeping of records which are necessary steps in pedigree breeding call for a great expenditure of time, with painstaking attention to details. The records must be kept in a complete and accurate form to be of value. Several years' work are necessary before the breeder can reap much benefit from his efforts and too often he finds that comparatively few people will pay a sufficient price for pedigree stock to make its production profitable.

Only those who have a natural inclination to do such work and can plan a long-term breeding program should undertake it. Few realize until they have undertaken pedigree work how complex the breeding problem is. Properly conducted pedigree breeding is a positive means of flock improvement, but it requires too much time and skill to be recommended under most farm conditions. Most pedigree breeding being done in Canada is in the Record of Performance flocks which operate under the National Poultry Breeding Program. The inspectors under this policy can be relied upon to give useful leadership to those who have the time and the inclination to undertake this important work.

6. Breeding systems

The terms inbreeding, linebreeding, crossbreeding, outcrossing, incrossing and topcrossing are frequently applied to systems of breeding and these terms require a brief explanation.

(*a*) *Inbreeding.*—The mating of related birds is termed inbreeding. This method is often followed as a means of intensifying or making greater the good qualities of a flock. The breeder must keep in mind that weaknesses are just as likely to be intensified as good qualities and that too close inbreeding often results in decreased vigour, lower egg production and poor hatchability. However, a certain degree of inbreeding is necessary to obtain uniformity and consistency in type and production. Foundation breeding stock should preferably be secured from closed flocks, that is, flocks in which no new blood has been introduced for a period of years. In farm flock management, it is not necessary to secure males that are unrelated to the flock every year, but matings as close as father and daughter, mother and son, and brother and sister, should not be made too frequently.

(*b*) *Linebreeding.*—Linebreeding is the use of related birds in matings according to a definitely planned system. When used skilfully this method will intensify the good qualities of a flock without the dangers of close inbreeding and it is generally believed to be the most desirable method of attaining flock improvement.

(*c*) *Crossbreeding.*—This is the mating of two distinct breeds or two varieties of one breed. Crossbreeding is done with the belief that it improves the vigour of the resulting chicks, to produce chicks of which the sex can be determined at hatching time by the down colour or to improve the progeny from a meat producing standpoint. The New Hampshire × Barred Plymouth Rock cross is one from which the sex of chicks can easily be distinguished at hatching time since the pullet chicks lack the white spot on top of their heads that the cockerels possess. Chicks of the same cross are raised extensively by poultrymen who find livability higher among them than among purebred Barred Plymouth Rock chicks. An example of crossbreeding to improve the progeny for meat production is the Cornish × Barred Plymouth Rock cross. The Cornish breed is noted for its development of breast muscle and the progeny of this mating carry decidedly plumper breasts than do Barred Plymouth Rocks. Crossbred chicks usually possess a high degree of uniformity but this is lost in succeeding generations. To avoid a return to mongrel conditions, crossbred birds should not be used in matings.

(*d*) *Outcrossing.*—The term outcrossing is applied to the mating of birds of the same breed but of entirely different strains. This practice often results in improved vigour just as where crossbreeding is done but when two strains do not "nick" or combine perfectly there will be a lack of uniformity in the progeny.

(*e*) *Incrossing.*—This term is used when the two strains crossed are inbred or are from two closed flocks.

(*f*) *Topcrossing.*—Topcrossing is the term employed when an inbred male or a male from a closed flock is mated to unrelated females not in or from a closed flock.

7. Sex determination

Because egg production is usually more profitable than meat production, the cockerels in a flock are often looked upon as a necessary evil. Undoubtedly it would be of great advantage if the sex of eggs could be determined before they are incubated but, to date, no satisfactory method of doing this has been discovered. In recent years, however, methods of sex determination of newly hatched chicks have been studied to the point that persons experienced in the art (sexers) can reach a high degree of accuracy. The result of this is that most hatcheries now quote prices on day-old cockerels and pullets as well as mixed-sex chicks. Pullets are more in demand than cockerels, especially with Leghorns, and it is believed that the number of cockerel chicks destroyed by gassing annually in Canada may reach several millions.

External means of sex distinction include rate of feathering, colour of down, colour of shanks and pattern of plummage. The so-called Japanese method of sexing requires an examination of the cloaca after causing an eversion of the anus by pressure of the fingers. The various methods of sex determination may be briefly outlined as follows:—

(*a*) *Sex-linked breeding.*—With this method, breeds, varieties or strains must be crossed in a definite manner to produce chicks of which the sexes differ either in colour or pattern of plumage, or in length of wing feathers. The possibilities of sex-linked breeding are summarized in very abbreviated form in the following table:—

Type of Cross	Male Parent	Female Parent	Appearance of Chick
1. Unbarred male.... × Barred females	Any coloured variety except barred or cuckoos and any white variety except White Rock and White Leghorn.	Barred Rock.......	Females have black head crown and black shanks. Males have white on crown of head and lighter shanks.
2. Gold males....... × Silver females.	Rhode Island Red. New Hampshire. All buff varieties. All black, red and Partridge varieties.	All Columbian patterned varieties. All silver laced and silver pencilled varieties.	Females are buff or red, males are cream or white. Both sexes may show red or black ticking or striping.
3. Fast feathering males........... × Slow feathering females.	Any fast feathering male such as normal White Leghorn.	Any slow feathering female such as Barred Rock may be same breed as male or different breed.	Females have wing feathers longer than ¼″ with alternate long and short feathers, usually not longer than ¼″. All feathers uniform in length.

(*b*) *Autosexing.*—Certain breeds such as the Barred Plymouth Rock, Rhode Island Red, New Hampshire, and Brown Leghorn possess down colour or pattern characters which permit sex identification of the day-old chicks and are called autosexing. Geneticists have also developed new autosexing breeds which may gain in popularity. Examples of these are the breeds developed in England and known as Cambar and Legbar. These breeds will produce differently coloured sexes without crossbreeding.

(*c*) *Japanese method.*—By this method the cloaca is everted by pressure of the fingers until the process, a very tiny eminence located in the lower middle part of the cloaca, can be seen. The processes are very small and there are several types in both pullets and cockerels. This makes distinction of sexes a fine art and considerable practice is necessary to reach a high degree of accuracy. This method has the advantage that it can be applied to all breeds.

To be successful with this method the sexer must have good eyesight, small and nimble fingers and must be able to handle chicks quickly but gently. When done carefully, sexing by this method should not injure the chicks.

8. Selection of breeders

Where the entire flock is not mated, there is an opportunity to make a selection of the birds entering the breeding pens and this should be as rigid as possible.

(*a*) *Selecting females for breeding.*—Where trapnesting is done, the progeny test as well as the individual performance records will, of course, be used in selecting the females for the breeding pens. In other flocks, the females should have originated from an improved strain in order to benefit from the work done by pedigree breeders. Experience has shown that it is a waste of time and effort to rely on mass selection for improving complex characters such as egg production. In addition to having originated from an improved strain, the females put in the breeding pens should be excellent egg producers and conform to the size, type colour, and other requirements for the breed as given in the *American Standard of Perfection*. Many poultrymen depend entirely on pullets for breeders and there is no objection to this practice provided they are from an improved strain. well developed, and show indications of good egg production.

CHICK SEXING

Good light, good eyesight and nimble fingers are necessary for rapid and accurate sexing by the Japanese method.

(*b*) *Selecting males for breeding.*—Males should always come from an improved strain, preferably one different from that of the pullets in order to benefit from the vigour resulting from crossing. An ever increasing number of R.O.P. day-old cockerels are available to Canadian poultry producers at reasonable prices. Males should preferably come from progeny-tested parents and should be sister-tested when their parents are not yet progeny-tested. The selection of breeding males should begin early, preferably when they are about six weeks of age. Too often, all the rapid-growing, early-hatched cockerels are killed for market and the breeders are kept from the younger and slower maturing birds. Cockerels which, in addition to having progeny-tested parents or good performing sisters, feather early, grow rapidly, show good fleshing characteristics, mature reasonably early, are blocky in type and of good size are most desirable. Normally, approximately two to three young males should be retained for every male needed the following spring. In addition to the characters mentioned previously, the males when placed in the breeding pens should show evidence of vigour, aggressiveness and good condition as well as size, shape, colour, freedom from *Standard* defects and disqualifications of their breed and variety.

9. Management of breeding stock

The results at hatching time are influenced by the care given the breeding flock before and during the hatching season. Fortunately good care does not call for a great expenditure of time or money.

(*a*) *Care of males.*—Hens lay equally well when not mated as when there are males in the flock. Egg quality is better when the males are excluded but it is seldom practical to provide winter quarters for them other than in the laying pens. They should always be removed from the flock at the end of the breeding season because fertile eggs deteriorate quickly in hot weather.

Metal guards, such as are attached to the beaks of birds to prevent feather pulling, are often effective in checking fighting among males. Frequently when two or more males are placed in one pen, fertility will be poor because of the interference, one with another, as they try to mate with the females. Temporary partitions, 2½ or 3 feet high, can be used to give the birds greater seclusion and will usually solve this problem. Afternoon matings as well as rotation of males are known to result in a higher level of fertility. When the spurs of old cock birds become very long and pointed, it is advisable to cut off their tips with a hacksaw as a means of preventing injury to the hens during mating. Every effort should be made in severe winter weather to prevent the males from freezing their combs because freezing greatly lowers their vitality.

(*b*) *Care of females.*—The management of females in breeding flocks is not greatly different from the management of layers. Special attention should be paid to the provision of sufficient vitamins in the diet, as is pointed out in Lesson 9. With large flocks kept solely for egg production, it is a common practice to keep the hens enclosed from the time they enter the laying pens until they are marketed. Naturally all pullet flocks are enclosed during their first winter of egg production where cold weather prevails at this time but it is believed that those which are retained as breeders in the second year should have access to good range during the summer months. The sunlight and green feed they get at this time are both beneficial and it is believed they result in better hatchability in the following spring. Birds that are to be used for breeders should not be unduly forced for egg production during the winter months either by feeding or the excessive use of electric lights. In general, hatchability is high when production is good and the strongest chicks are produced during periods when the egg production of the flock is increasing.

10. Matings

With flocks of the American and English breeds, one male may be mated with about 15 females in the winter and early spring months and with about 20 when the weather becomes warmer. With the light-weight breeds, such as Leghorns, one male can be mated with about 20 females early in the season and 25 later. The heavy Asiatic breeds are not raised extensively but with them there should be one male to from 8 to 12 females. These recommendations are for matings in which active cockerels are used. With cock birds the matings should be somewhat smaller.

Mass, flock, or pen, and individual mating are the two methods commonly practised on farms. Stud mating is sometimes done by the breeder of pedigreed poultry and artificial insemination is possible in the making of difficult crosses in experimental work such as where breeds being crossed differ greatly in size.

In mass mating, the necessary number of males are placed in a large flock of females and of course the parentage of individual chicks produced from such matings cannot be traced. In individual mating, one male is penned with the number of females that he is capable of mating with and, if the birds are trapnested, the parentage of all chicks produced by the flock can be recorded. With stud mating the males are kept in individual coops or small pens and hens are placed with them one at a time and long enough for mating to take place. As with individual mating, this method makes the keeping of individual pedigrees possible.

Hens should be mated from a week to ten days before the eggs laid are used for incubation. Where a change of males is necessary in a pen mated for pedigree breeding, a period of two weeks should elapse from the time of replacement of the first male until chicks are credited to the second male. Reasonably good fertility can be expected for two weeks after males have been removed from the breeding pens.

LESSON 12

CULLING POULTRY

Topics for Study

1. Definition of culling.
2. Why we cull poultry.
3. When to cull poultry.
4. Culling hatching eggs.
5. Culling day-old chicks.
6. Culling growing stock.
7. Culling mature pullets.
8. Culling cockerels.
9. Culling laying hens.

1. Definition of culling

The term "culling" is most often used regarding the removal of non-layers or poor layers from flocks of mature hens but in its broadest sense it can be applied to the sorting of undesirable hatching eggs, chicks, pullets, cockerels, hens, and cock birds from the more desirable ones. In contrast to culling, the term "selection" is used to denote the choosing of the best individuals in the flock. The points considered in culling and selecting poultry are the same. The poultryman culls out his poorest layers because they are unprofitable and selects the best for breeders because he knows that high egg production is an inherited tendency. The term "cull" implies something that is undesirable. We should remember, however, that culls from breeding flock may be excellent layers and culls from the laying flock may be highly desirable for meat.

2. Why we cull poultry

Culling is an important factor of management in making a flock profitable. Eggs which are badly soiled, mis-shapen, oversized or undersized and that have cracked, ridged, or porous shells are discarded for incubation either because they will not hatch or because chicks hatched from them are likely to be less desirable than those from normal eggs. Crippled and deformed chicks not only spoil the appearance of a flock but can seldom be raised profitably and it is advisable to kill them rather than retain them in the flock. Chicks which do not thrive during the growing season are liabilities rather than assets and among those that reach maturity there are always pullets which should never have entered the laying pen and cockerels that are far from ideal for breeding purposes.

In practically all flocks of laying hens that have not been culled it is possible to find good, medium, and poor egg producers. There is no clean-cut distinction between these grades. A poor producer may pay some profit when eggs are worth 60 cents a dozen but will be kept at a loss when eggs bring only 30 cents. A flock that has not been culled may contain hens which have never laid and at some seasons of the year there will certainly be birds which have ceased their season's production and are being kept at a loss. There are cases on record where half an entire flock was marketed as culls without affecting its egg production. Frequently birds will bring a better price if marketed as soon as they stop laying than if kept until later in the year. The owner, in such a case, not only gets a higher price for the birds culled from the flock but makes a saving in his feed bill. The birds left in the flock frequently lay more eggs than before the culling was done because of less crowded conditions. In addition to these immediate benefits, the flock owner has retained the birds which are most likely to lay well in their second year of production and to be the most valuable breeders.

3. When to cull poultry

The most effective culling begins with the eggs used for incubation and is a continuous process as long as birds are kept on the plant. Birds should be removed from the flock as soon as they become undesirable or unprofitable for the purpose for which they are being kept.

4. Culling hatching eggs

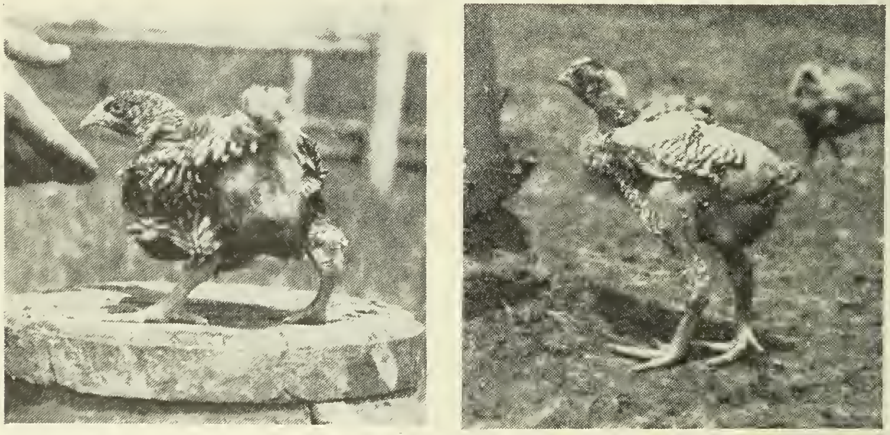
Eggs that are mis-shapen, oversized, undersized, off-coloured, cracked, badly soiled, or with poor-textured shells should be discarded when selection for incubation is made.

5. Culling day-old chicks

As chicks are taken from the incubator, any which are puny, weak on their legs, deformed, or blind should be destroyed. Others having minor defects such as slightly crooked toes or off-coloured down may be retained and grown for market poultry but not with the expectation that they will be kept as breeders.

6. Culling growing stock

In a small-sized flock of chicks it may not be necessary to do any culling during the growing season but in large flocks some culling is usually advisable. Poor development, slow feathering and the effects of accident or disease are the principal reasons for culling during this period. Chicks that have defects such as crossed beaks, crooked toes, and off-coloured plumage may be kept until they can be marketed profitably but they spoil the appearance of the flock and should be killed as soon as possible.



CULLS

Left, chicken with slipped tendon. Right, very slow feathering chicken.

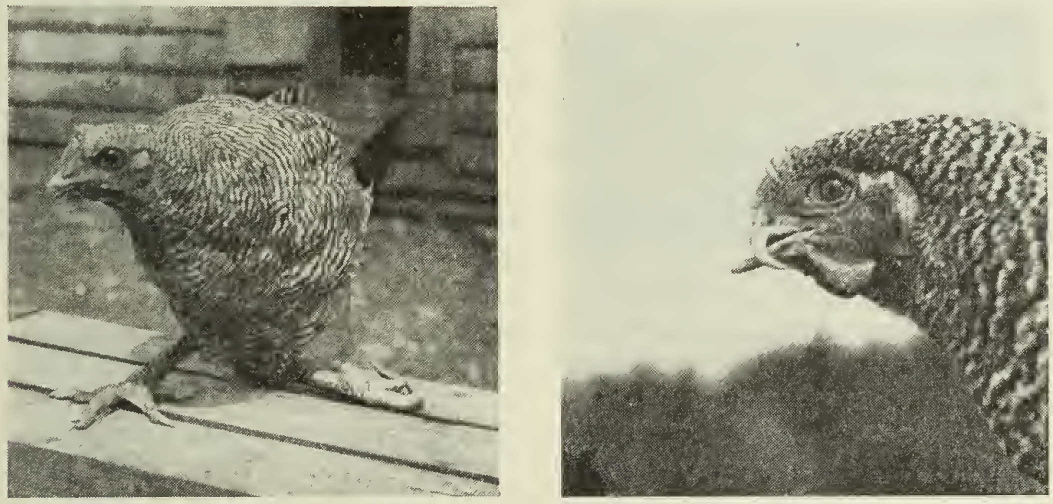
7. Culling mature pullets

Pullets are the most valuable individuals in a flock that is being kept for commercial egg production and the profits of the business depend on their excellence to a considerable degree. Unfortunately we have not learned to forecast with any degree of accuracy before her production begins, how many eggs a pullet will lay. It is important, however, to do some culling when the pullets are moved to winter quarters. If done when from 10 to 20 per cent of the pullets have started to lay, it will be possible to detect and remove those that are unduly slow in reaching maturity. Pullets that are undersized or poor in flesh should be culled at this time. Culling for disqualifications and defects should be in keeping with the purpose for which the flock is being kept. Pullets which have stubs, sprigs, split wings, wry tails, squirrel tails, or off-coloured plumage are decidedly objectionable in a breeding flock but may make equally as good layers as birds that do not possess these faults.

Apart from maturity, development and fleshing, which are important factors in selecting pullets for the laying pen, the flock owner should consider the head type of each bird and particulars regarding this are explained under the section dealing with the culling of laying hens. The best results in production are secured where it is possible to have all the pullets placed in any one pen with about the same degree of maturity.

8. Culling cockerels

Most cockerels are raised for meat production, and with such, the only culling necessary is the removal of any that have been injured, are sickly, or are weaklings.



MORE CULLS

Left, cockerel with deformed leg. Right, pullet with crossed beak.

The culling of breeding cockerels should be specially rigid. Pedigreed cockerels with ancestry showing good body type, high egg production, good egg size, and good hatchability should be used in mating flocks where egg production is a major consideration. While such a pedigree is desirable, it should be in addition to good individuality and not a substitute for it. Breeding cockerels should conform to the *American Standard of Perfection* in type, size and colour and be free from *Standard* disqualifications and defects. They should be vigorous and show plenty of masculinity which can be detected by frequent crowing and a challenging disposition. They should have full breasts and stand on straight legs which are set well apart. They should have the necessary size and vigour without coarseness of bone, skin, comb, or wattles. Careful culling is required to attain these objectives and the selection should begin when the cockerels are about six weeks old.

9. Culling laying hens

Regular culling of the laying flock is essential if it is to be kept at a profit. Its importance is so generally recognized that many use the word "culling" only in connection with mature hens.

(*a*) *Catching and handling the birds.*—An experienced poultryman can often detect culls in his flock without handling the birds but, for a systematic culling, they should be caught and handled individually. A catching crate which will hold about 20 hens is useful where a large flock is to be handled. In smaller flocks, the birds may be caught with a wire hook but care should be taken in its use to avoid injury to their legs. The egg production of the flock will be least affected when the birds are caught and handled quietly.

WIRE CATCHING-HOOK

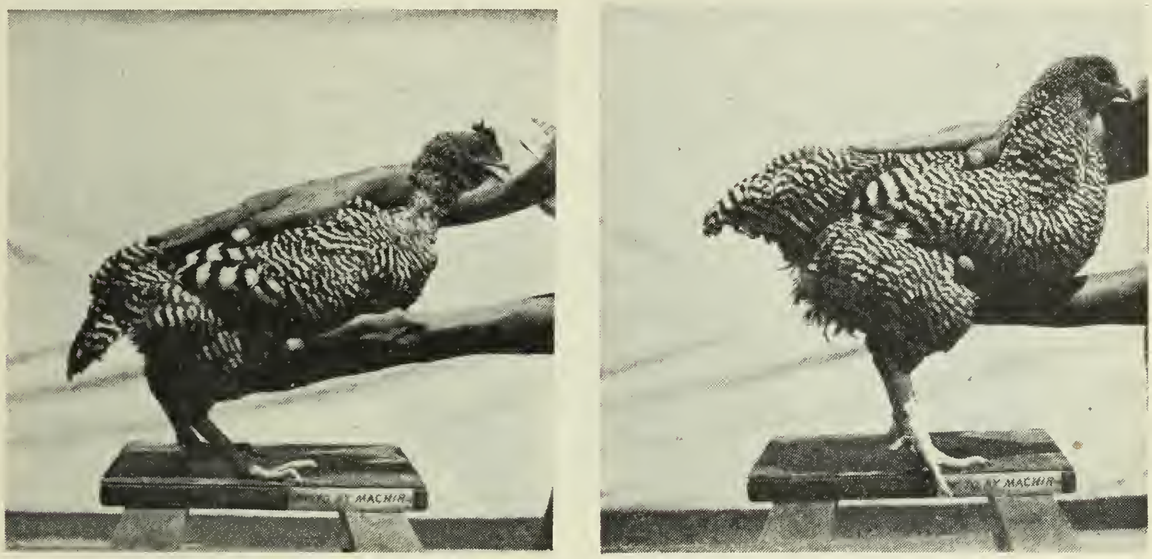
For examination, the birds are held, in turn, with the body resting on the palm of the hand and facing the person doing the culling. The forefinger extends between the bird's legs while pressure from the thumb on one side and the second finger on the other, holds the bird securely. This manner of holding the bird is comfortable to the hen and leaves the operator with one hand free to make a thorough examination of the bird.

(*b*) *Appearance of laying and non-laying hens.*—The comb, ear lobes, and wattles of the hen which is not laying will be dry, shrivelled, and cold to the touch in contrast to the larger, full, waxy, and warm head parts of the bird that is in full production. The eye ring and beak of the non-layer will bear a decidedly yellow colour, while those of the layer will be bleached to white or pinkish white. The pubic bones (the bones slightly below and on either side of the vent) are close together in the bird which has not been producing and spread wide apart in the one that is in full production. The abdomen of the non-layer will feel hard, shrunken and "tucked-up" with the skin harsh and thick, while in the laying hen it will be full and soft with a thin and pliable skin. The vent of the bird which has been out of production will be small, rounded, puckered, and yellow in colour compared with the large, oval, moist, and well bleached vent of the laying hen.

(*c*) *Estimating present and past production.*—The preceding paragraph gives information which will enable the flock owner to determine whether or not his birds are laying. Such information is sufficient for the culling of birds which are out of production but where breeding pens are to be selected, the owner wants to know when each hen began to lay, how long she laid, the rate of her production, and whether or not she took any rest periods. Trapnesting will furnish this information more accurately than culling methods but is not practical on most farms. A further knowledge of the principles of culling will enable the poultryman to make a reasonably accurate estimate of the production of his birds.

(*d*) *Pigment changes.*—Most of the common breeds of chickens have a yellow skin. Before laying begins, the pullets have a decided yellow colour in the shanks, beak, eye ring, and vent. The yellow pigment is also found in the ear lobes of birds of the Mediterranean breeds. This yellow pigment or colour comes from the food the hen eats and is the same material which colours the yolks of the eggs. When a hen is laying, the colouring matter from her food goes into the eggs she lays and that which was present in the parts named above fades out. If she stops laying, the pigment is again deposited in the body parts.

When a pullet's production begins, the yellow colour fades very quickly from the vent, disappearing when about half a dozen eggs have been laid. In most cases the production of a dozen eggs will bleach the eye ring. The ear lobes bleach just a little more slowly. The beak loses its colour, first at the base and gradually towards the tip, taking from four to six weeks and a production of from 30 to 40 eggs to become entirely bleached. The shanks bleach more slowly and are not entirely faded until the bird has been in continuous production for a period of from four to six months, during which time she will have laid from 125 to 175 eggs.



DETERMINING RELATION OF KEEL TO BACK

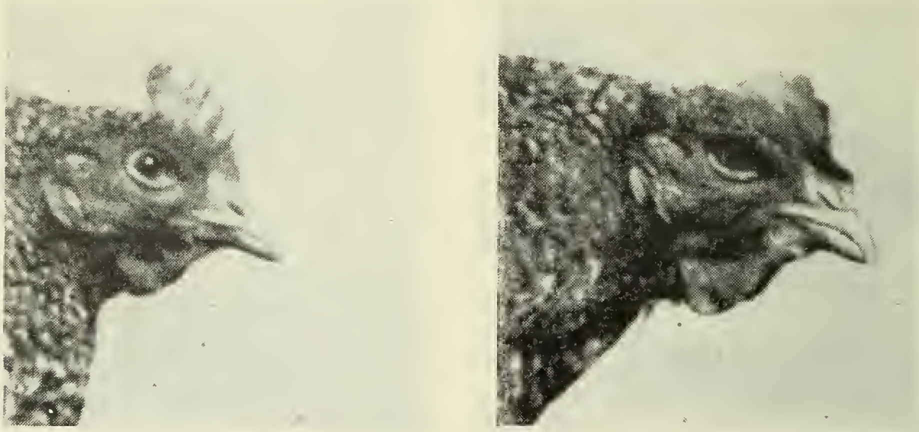
With the high producer (left), the finger tips of the lower hand point downward. With the non-producer (right), the finger tips of the lower hand point towards the tail. (Photo, courtesy of Kansas Agricultural Experimental Station.)

Many factors influence this rate of bleaching including the size of the hen, the feeds given, the rate of production, the breed, variety, strain, individuality, age, and health of the birds.

An examination of birds for pigment changes must be made in daylight. It is difficult to distinguish between white and yellow under artificial light.

(*e*) *Moult.*—Hens usually retain their feathers as long as they continue to lay regularly. A few hens will lay while moulting but usually egg production ceases when moulting begins. To make high yearly records, hens must lay until quite late in the fall without interruption. The stage of moult during the fall months can be used in estimating when a hen ceased laying. With this information, the length of her season's production can be estimated and this in turn is helpful in estimating what her yearly production has been. The time of hatching must be considered in relation to the time of moulting when estimating production. Hens which moult late usually moult most quickly and are back in production with a minimum loss of time. Early moulters seldom make high yearly egg records.

The neck feathers are usually the first to be dropped in a general moult and are followed by those of the back, body, and wings. The wing feathers are dropped in a regular order which makes it possible to estimate how long the bird has been moulting and therefore (usually) not laying. When the wing is spread out, it naturally divides into two sections. On the outer part are 10 long feathers each having the shaft near one side and known as primary wing feathers. On the section nearest the body are the secondary wing feathers. These are also long feathers but with the shaft in the centre. Between the primary and secondary wing feathers is a smaller feather known as the axial feather. When a hen moults, the first feather to be dropped from the wing is the innermost primary, or the one nearest to the axial feather. In about two weeks the next primary feather is dropped and they continue to shed in regular order at about two-week intervals, the outermost feather being the last to loosen and fall out. New feathers quickly replace those which have been shed. It takes about six weeks for each new primary feather to reach its full length. Knowing that the primary feathers drop at intervals of two weeks and that six weeks is taken in growing each replacement feather to its full length, it is easy to estimate how long the bird has been moulting. This regularity of moulting wing feathers is most pronounced with early moulters. Late moulters occasionally shed only part of the primary feathers and frequently lose two or more at one time.



A COMPARISON OF HEAD TYPES

Left, the lean or clean-cut head of a heavy layer. Right, the coarse or beefy head of a poor producer.

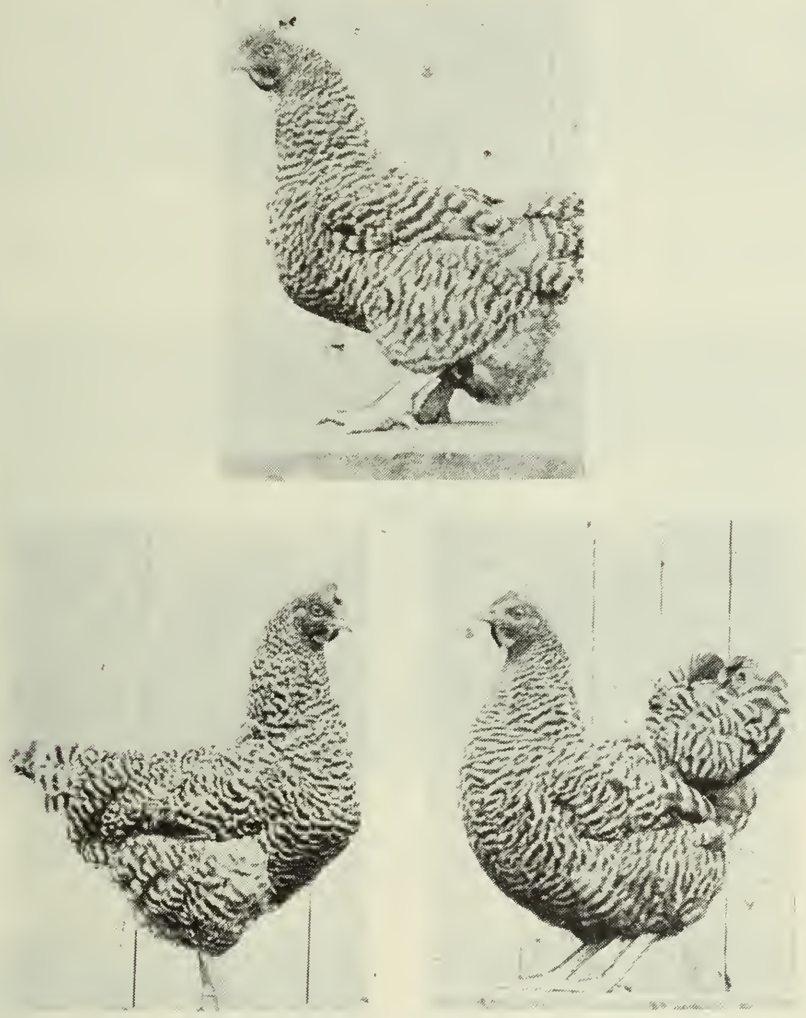
(*f*) *Head Type.*—The head of a typical high-laying hen is medium in length and width, clean cut, free from wrinkles, beefiness or coarseness and with a bright prominent eye. Poor types of heads are those which are long and shrunken in front of the eye and called "crow heads", those with overhanging brows, wrinkled or beefy heads, those that are over-refined, those which are sunken-eyed and those with very narrow points on the comb. The head is usually a valuable index of the hen's value as a layer.

(*g*) *Body type.*—Hens differing very widely in type have made high egg records and it is doubtful if any one type can be considered best for egg production. The high egg producer must, however, have body room for a digestive system that can utilize a large amount of feed and for large egg laying organs. This requires a body that is relatively broad and deep. The back should be broad and flat and carry its width well back. The breast should be full and prominent with the keel bone long and straight. When in a laying condition, the good hen will be deeper behind than in front and, when handled, will show good width between the pubic bones and good depth from the pubic bones to the tip of the keel.

(*h*) *Temperament.*—The high laying hen is active. She leaves the roost early in the morning, spends the day searching for food and is late in going to roost at night. She is usually comparatively tame, appears happy and is often heard singing. Poor layers, on the other hand, spend much of their time on the roosts and are timid and inclined to squawk when handled.

(*i*) *Plumage.*—The hen that has laid heavily during the winter and spring months loses much of the oiliness and gloss of her feathers. They become dry and brittle and are often ragged and broken.

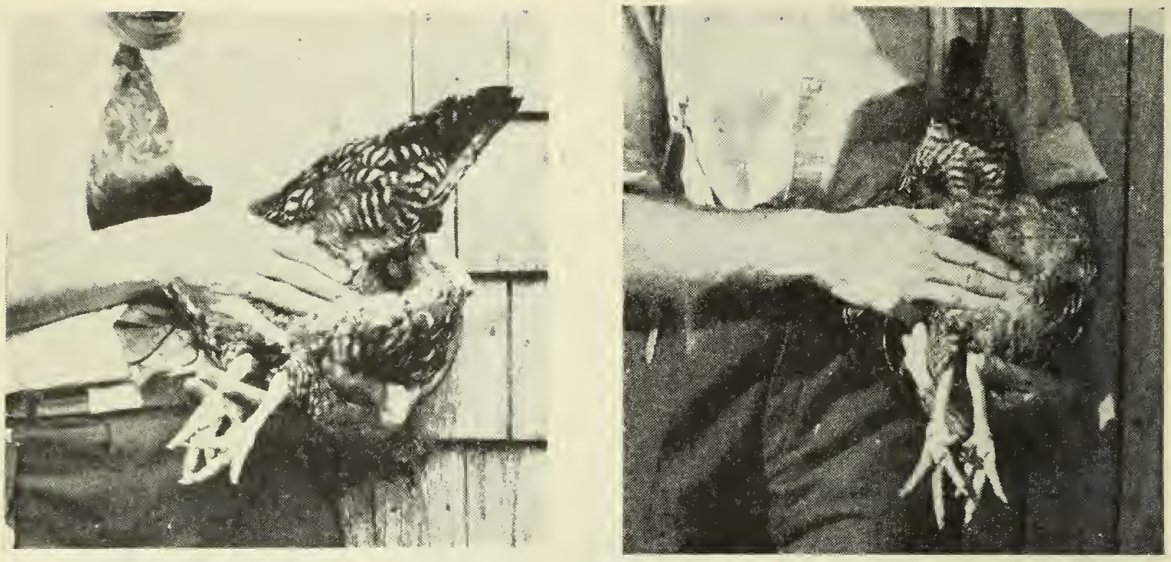
(*j*) *General considerations.*—Culling can not be done accurately by a consideration of one factor only. As examples of this, an occasional hen is found which carries considerable pigment after prolonged heavy laying and likewise hens with crow heads sometimes make very high egg records. If birds in the first mentioned case were judged by the amount of pigment they carry in beaks and shanks, they would be discarded as culls as would the high-record crow-headed hens if judged by head type only. The same is true of the other factors explained in the preceding paragraphs. All the factors which have been explained should be considered in arriving at a decision as to the hen's value as a layer, and for the most efficient culling the past history of the flock must be known.



A STUDY IN BODY TYPES

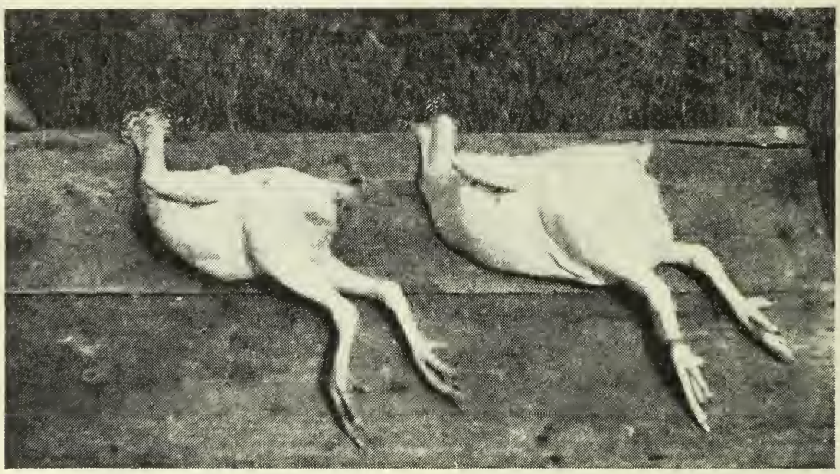
Left, a good type for high egg production. Note her horizontal back, sloping underline, good length of keel and full abdomen. Centre, a low-producing type. This bird has a relatively short keel bone and is inclined to deposit internal fat which causes sagging of the abdomen at the rear of the keel bone. The abdomen of this bird is quite hard to touch. Right, a low-producing type. This bird is very short and has a round underline which is seldom found in high producers. She is also relatively loose-feathered.

Even the high-producing hens must have a rest period at some time. When not laying their heads become coarser, the pubic bones become closer together and increase in apparent thickness. The distance from pubic bones to tip of keel becomes less. The handling quality of the skin becomes poorer, and comb and wattles shrink in size and lose their bright colour. When moulting, all birds are sensitive to handling and even good layers are timid at this stage and squawk when handled. The above statements will indicate the need of making repeated cullings of the flock, since the best layers may be classed as culls if handled at a season when they are not in production.



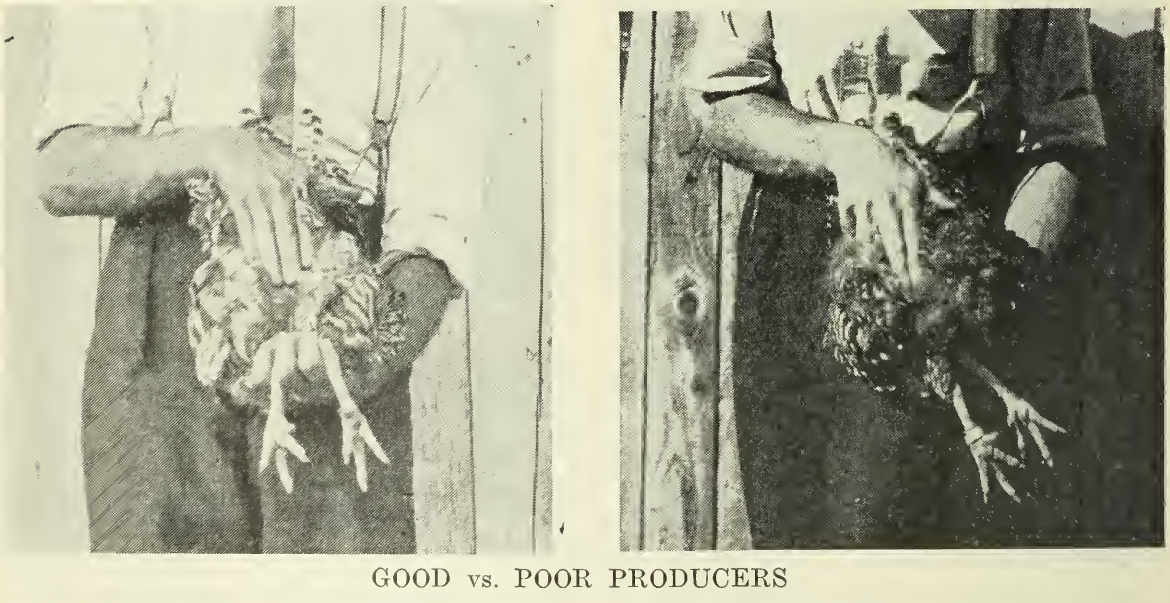
GOOD vs. POOR CAPACITY

Left, deep from pubic bones to tip of keel, indicating capacity for high production. Right, shallow from pubic bones to tip of keel, indicating lack of capacity.



ANOTHER STUDY IN CAPACITY

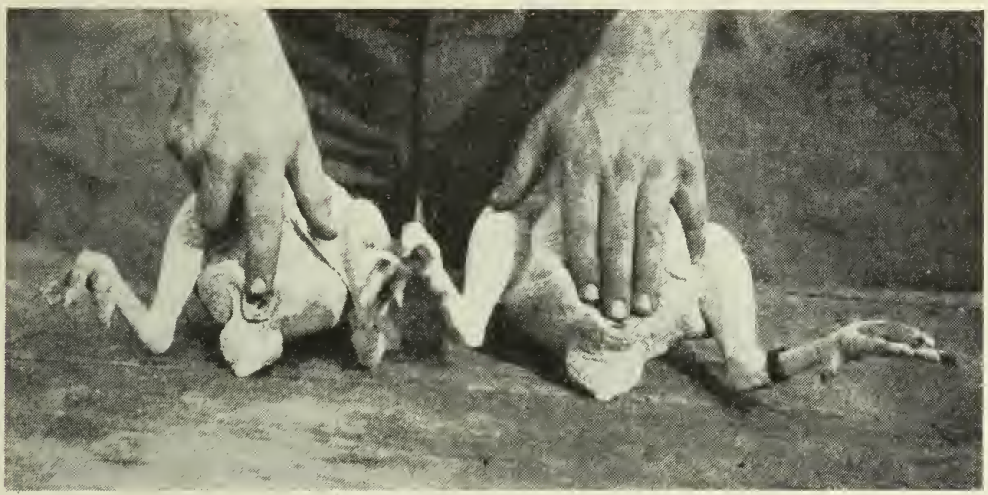
Left, body shallow at the rear, indicating lack of capacity. Right, body deep at the rear, indicating capacity for high production.



GOOD vs. POOR PRODUCERS

Left, good width between the pubic bones, indicating heavy production. Right, narrow between the pubic bones, indicating poor production.

(*k*) *Estimating future production.*—Estimates of the past production of laying hens are usually much more accurate than estimates of how many eggs pullets are likely to lay that are made before their production begins. It is fairly safe to assume, however, that hens which have been good layers in their first year of production will continue to be good layers in the future. They have shown the stamina that is necessary to survive a long season of egg production and are the most desirable hens to keep for either a second year of egg production or for breeders. Under most circumstances, from one-half to two-thirds of the flock should be culled at the end of the first year of production. It seldom pays to keep layers for a third season.



WIDTH BETWEEN PUBIC BONES

Left, narrow width of the non-laying hen compared with right, the much greater width of a high laying hen.

(*l*) *Culling chart.*—The points considered in culling the non-producing hens from the flock are well summarized in the following chart:—

Character	*Layer*	*Non-layer*
Health	Good, active, alert, in good flesh	Dull, listless, thin or overfat and broken down behind
Moult	Not moulting until last of September or later	Moulting in August or early September
Comb and wattles	Large, red, waxy	Shrunken, dull in colour, scaly in appearance
Face	Clean-cut, lean	Wrinkled, beefy
Eye	Bright, prominent, and full of life	Sunken, dull, listless in appearance
Eye ring	Thin, white	Thick, yellow
Pubic bones	Thin, flexible, wide apart	Thick, less flexible, close together
Abdomen	Deep, soft, pliable	Shallow, hard, unyielding
Skin	Soft, thin, silky	Hard, thick, harsh
Vent	Large, expanded, oval, moist	Small, puckered, round, dry
Shanks	White, flat, thin	Yellow, round, thick
Beak	White	Yellow
Plumage	Worn, broken, faded, close-feathered	New, or bright, glossy, loose-feathered

LESSON 13

JUDGING POULTRY AND POULTRY PRODUCTS

Topics for Study

1. Judging market eggs.
2. Selecting and shipping egg exhibits.
3. Judging day-old chicks.
4. Selecting and shipping chick exhibits.
5. Judging poultry for *Standard* qualities.
6. Selecting and shipping *Standard* poultry.
7. Judging poultry for utility qualities.
8. Selecting and shipping utility poultry.
9. Judging dressed poultry.
10. Selecting and shipping dressed poultry exhibits.

Poultry exhibitions have played an important role in the development of the poultry industry. They became popular about the middle of the nineteenth century when poultry raising was largely a hobby of poultry fanciers. Interest in poultry exhibitions has waned with the advent of motor cars, motion pictures, radios, and other forms of amusement. While exhibitions of utility fowls, market eggs, day-old chicks, and dressed poultry have never attained the popularity which *Standard* live poultry shows once held, they have aroused interest, spread information, and otherwise assisted in the development of the poultry industry.

An exhibition where the products are judged on their merits is a contest that appeals to many. Since there must be losers as well as winners, it develops good sportsmanship. If the placings are studied and the reasons for making them sought an exhibition can have a great educational value. The exhibitor learns to recognize quality and the ideal in the product he is showing and with this knowledge he can strive for greater achievement.

1. Judging market eggs

Egg shows have been less popular in Canada than live-bird shows and yet classes for eggs are commonly found in the prize lists of exhibitions and fairs. The objects of holding egg shows are to teach the points on which eggs are judged, to improve the quality of market eggs and to increase consumption by teaching the differences which exist in egg quality.

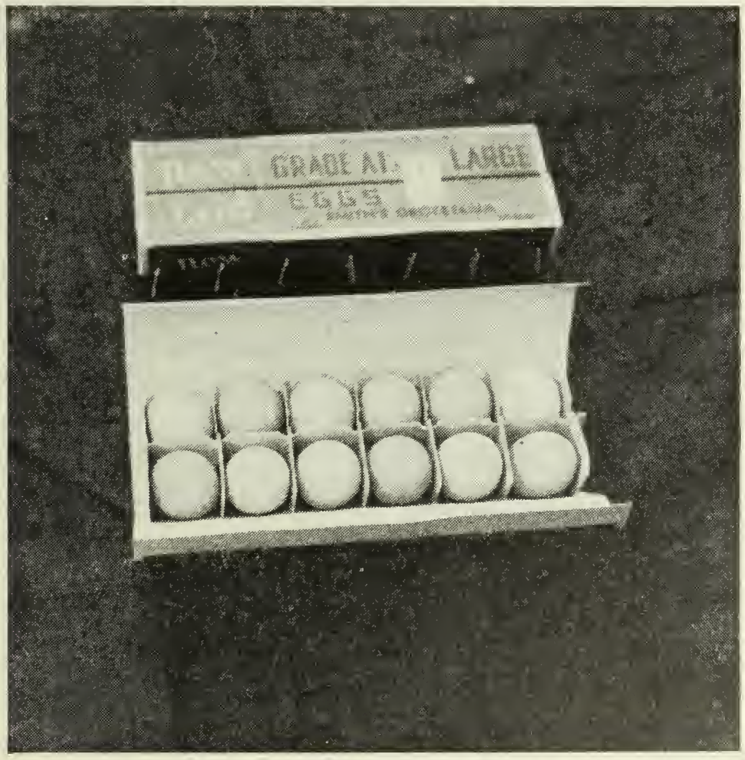
Entries usually consist of standard 30-dozen cases, one dozen lots and other fractions of full cases. There should be classes for both white and brown shell eggs since they cannot be judged satisfactorily together. Entries of single dozens are usually limited to producers while competition in the larger entries is open to packing houses, co-operatives, and other organizations as well. The heaviest competition will be in the Grade A Large and Grade A Medium classes but classes for Grade A1 Large and Grade A1 Medium should be provided if there are any producers of this grade in the area from which the show draws its entries.

2. Selecting and shipping egg exhibits

Eggs being shipped to an exhibition should be very carefully selected and packed so that they will arrive in the best possible condition. One-dozen cartons are very satisfactory containers for single dozen entries. There will be less danger of breakage if cartons are surrounded with excelsior pads before being wrapped and care should be taken that nothing comes in contact with the carton that will soil it. Egg cases, either of 15- or 30-dozen capacity, depending on the size of the entry, are most satisfactory for shipping the larger entries. Where the size of the container permits, it is advisable to send a few extra eggs so that replacements can be made if a few are broken during shipment. Express or truck shipments of case lots should be covered with strong wrapping paper to prevent their becoming soiled. Cases and cartons should bear proper-grade markings. All eggs should be packed with the large end uppermost and plenty of excelsior pads used to reduce the danger of breakage. All containers should be marked "Eggs" to ensure their being handled carefully.

SELECT EGG ENTRIES FOR COLOUR

Colour differences are not recognized in market egg grades, but white and brown eggs should be shown separately in exhibition classes.



A SINGLE DOZEN EXHIBITION ENTRY

The factors to consider when selecting eggs for exhibition are the actual weight of each egg, uniformity of weight, uniformity of shape, uniformity of colour, shell texture, shell condition, interior quality, and freedom from disqualifications.

(*a*) *Individual egg weights.*—All eggs in an entry should conform to the specified weights for the grade concerned.

(*b*) *Uniformity of weight.*—It is desirable that the eggs in an entry be as nearly alike in individual egg weight as it is possible to get them.

(*c*) *Uniformity of shape.*—The typical egg shape is oval. There is, however, a great deal of variation and it is desirable that all eggs in one entry should be uniform in shape.

(*d*) *Uniformity of colour.*—All eggs in an entry should have the same shell colour or be as nearly alike as possible. In a class for white shelled eggs the colour should be chalk white without any tint of creaminess. The shade of brown eggs can vary greatly but all eggs in an entry should be as near the same shade of colour as possible.

(*e*) *Shell texture.*—The shells should be strong and smooth and without roughness, porousness or tiny cracks which can only be seen on candling.

(*f*) *Shell condition.*—Eggs should be clean and possess the natural bloom that is found on a new laid egg.

(*g*) *Interior quality.*—Egg quality is determined by candling and should meet the requirements of the grade exhibited.

(*h*) *Disqualifications.*—Entries should be disqualified if the eggs are noticeably overweight or underweight for the grade exhibited, if any contain large meat or blood spots or if there is unmistakable evidence that they have been incubated.

3. Judging day-old chicks

Baby chick shows have gained considerable prominence in the United States in recent years but have been little heard of in Canada, perhaps due to the fact that no section of this country has the same concentration of hatcheries that is to be found in some parts of the United States. Such shows have a value in indicating to both hatcherymen and chick buyers the differences in quality that exist in day-old chicks.

A logical method of classification for a baby chick show in Canada would be to have each variety compete separately and with classes for R.O.P. Chicks, R.O.P.-Sired Chicks, and Approved Chicks in each variety. There might also be sub-divisions for cockerel chicks and pullet chicks.

The *American Standard of Perfection* describes the accepted colour for each variety of day-old chicks and contains a score card which allows points for vigour, condition, trueness to variety, colour, uniformity of colour, uniformity of size and weight. Faults which disqualify an entry are described and rules are given for cutting the score because of defects in any of the above-mentioned points or because of dead chicks in an entry.

4. Selecting and shipping chick exhibits

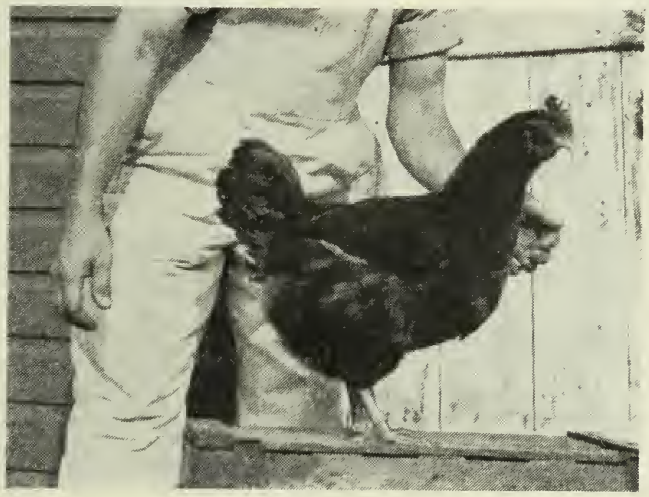
First prize in a baby chick show is a coveted honour among hatcherymen and no effort should be spared in making a careful selection of an entry.

Shipment should be made in ordinary chick boxes and sufficient extras should be included to permit of some selection when the chicks reach the show. Long distance shipment is a definite handicap to an entry.

5. Judging poultry for *Standard* qualities

Cock fighting was probably the first type of poultry contest staged by man and it is believed that the domestication of fowls thousands of years ago took place so that man could indulge in this sport. Poultry exhibitions, the contests with which we are familiar, had their beginning in America about the middle of the last century. In Lesson 2 we learned how interest in poultry exhibitions resulted in the development of many new varieties of poultry and the need of breed standards by which they could be judged. The American Poultry Association was formed in 1873 to meet this need and since that time has set the standards by which poultry is judged throughout the North American continent.

The *American Standard of Perfection* published by the American Poultry Association is the judge's guide in placing the awards in a poultry show. It describes the ideal weight, shape and colour of each breed and variety. It lists the faults which are considered serious enough to debar a bird from winning prizes. It describes the less serious defects and indicates how much the perfect score should be cut for each one present. It contains a score card by which each bird in a show can be scored on the basis of 100 points for perfection. With this system, the prizes are awarded in any class according to the numerical totals of the score cards for the individual birds. Experienced judges usually make their awards by comparison rather than by numerical scores. The birds are examined individually for both systems of judging.



TRAINING A PULLET TO POSE

Untrained birds often show to poor advantage.

Poultry judging standards, like fashions in clothing, change with the times. At present, plumage colour is a lesser factor than it was formerly and utility qualities receive more attention than they once did.

The proper cooping of a show makes it more attractive to the public and easier for the judge to do his work. Exhibition poultry coops are made of wire and in several sizes so that individual birds of the common breeds, bantams, turkeys, geese, ducks, and breeding pens can all be accommodated. Sometimes it is necessary to place the coops two decks high because of limited space but preferably there should be but a single row and placed on tables at a height that they can be viewed, tended, and handled conveniently. For easy and efficient judging as well as for study after the judging has been completed, the entries in any class should be placed in adjoining coops. In practice, individual males and females of the same breed and belonging to the same owner are often placed together. The birds are grouped according to variety and age, the age subdivisions being for cock, hen, cockerel, and pullet among chickens and with a similar classification for turkeys, geese, and ducks.

Poultry shows may be for one day only when held in conjunction with fall fairs but a period of from one to two weeks is not unusual. At best, they are a strain on the constitutions of the birds exhibited. The bringing together of strange birds in one room results in continuous excitement which is increased by the numerous visitors to the show. Too often the buildings in which poultry shows are housed are inadequately ventilated and it is not unusual to have outbreaks of respiratory diseases during an exhibition. Because of this danger, people who make their living from poultry raising are disinclined to exhibit them and poultry shows have ceased to occupy the prominent place in the industry that they once held.

6. Selecting and shipping *Standard* poultry

A thorough understanding of the *American Standard of Perfection* requirements is necessary in selecting poultry for *Standard* qualities and the exhibitor should provide himself with the latest edition of this book. Using it as his guide, he should carefully examine the birds of his flock that have a promising appearance and by this means select the birds which are to be entered in competition. White birds will present a much more attractive appearance if they are carefully washed in lukewarm water before being sent to a show. After being washed they should be held in a warm room until the feathers are completely dry. Where breeding hens are entered, there should be uniformity of size, type, and colour among the females making up the entry.

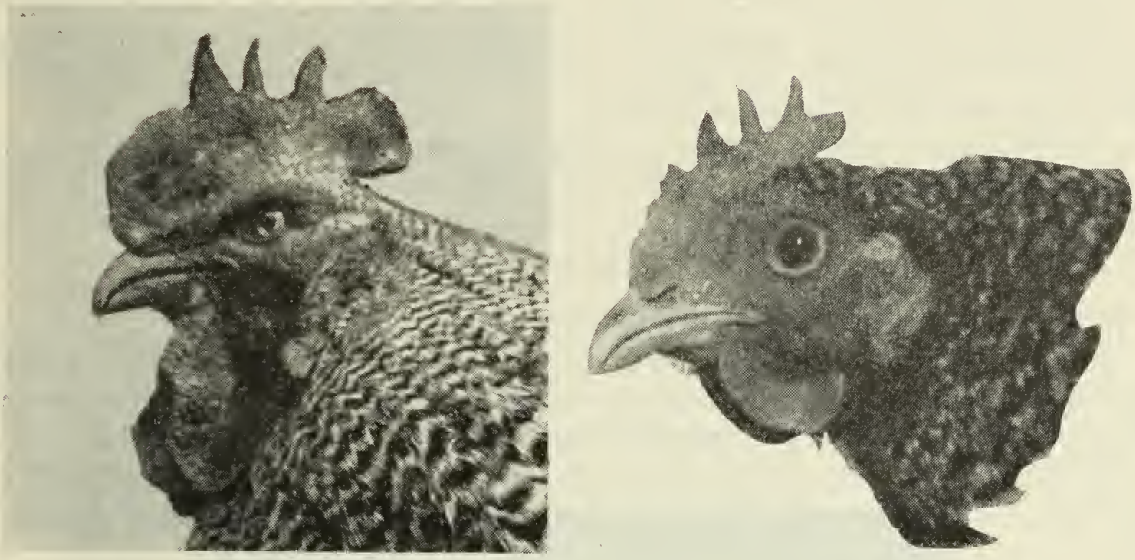
Shipping coops should be roomy and care taken to keep apart any birds that are inclined to fight. If the birds are shipped unaccompanied to the exhibition, it should be plainly marked on each coop what class the birds within are to be placed in. There is always a specified hour at which entries must be in place for the opening of the show and the wise exhibitor will have his birds delivered well in advance of this time. The feeding and management of birds on display is usually under the direction of the show management.

7. Judging poultry for utility qualities

Beginning about 1910, a few individuals and institutions began to develop strains of existing breeds which possessed egg laying qualities that were unknown heretofore. Much of this development was with Barred Plymouth Rocks and Single Comb White Leghorns. As a result of this work there were developed strains of hens that were quicker maturing, gave greater egg production, and showed less broodiness than had been usual but which varied from *Standard* requirements in such factors as size, type, and in the case of Barred Plymouth Rocks, in colour also. The term "utility" was applied to these new strains and for a time there was a definite clash between the breeders of *Standard* and utility poultry. Within a few years, exhibition managements began to add utility classes to their former prize lists. In some cases the number of these was extended far beyond the few breeds with which work had been done to increase egg production and, as a result, many birds were exhibited which were merely culls from a *Standard* viewpoint.

In spite of this shortcoming and the fact that there has never been a universally accepted *Standard* for judging utility poultry, these classes served a useful purpose. As the breeding of poultry passed from the hands of fanciers to those who were interested from the standpoint of making a living, utility qualities became the chief concern and appearance was a secondary consideration. In due time, utility poultry breeders found that they must pay more attention to body size, type, and colour of their birds and the remaining fanciers likewise improved their stock for the production of both eggs and meat. This tendency to "make the useful more beautiful and the beautiful more useful" has continued and, as a result, utility classes in exhibitions have lost much of their one time popularity.

Utility classes are grouped according to breed, age, and sex in exactly the same manner as *Standard* poultry. There seems no justification for having utility classes for more than the six or eight varieties of hens which are raised commercially in our country. Judging is done by the comparison method and the points considered include head type, body type, pigmentation, moult, *Standard* requirements, and quality.



MALE AND FEMALE BARRED PLYMOUTH ROCKS

The male head radiates vigour, the female head refinement.

(*a*) *Head type.*—In the preceding lesson the different types of heads found among laying hens have been described. The one most commonly found in high-producing hens is medium in size, clean-cut, free from coarseness or wrinkles and with a bright, sparkling, and prominent eye. Undesirable head types are described as masculine, coarse, beefy, over-refined and crow-type.

(*b*) *Body type.*—The body type of high-laying hens varies greatly and it is therefore difficult to define an egg type. In general, the *Standard* type will be found satisfactory for the production of both eggs and meat. High-laying hens have bodies which provide plenty of room for the vital internal organs. This calls for both good width and depth of body and these factors are determined by handling the birds. The body should be wide at the heartgirth or just back of the wings and the width should be carried well back towards the tail. The intestines and oviduct are much larger when a hen is laying than when she is out of production and, as a consequence, the pubic bones are well apart and the tip of the keel bone is forced downward in the laying hen. A long keel bone is preferred because it helps support the abdomen which might otherwise be inclined to be baggy. These body changes do not take place in male birds which must be judged largely for vigour, type, breed characteristics, and masculinity.

(*c*) *Pigmentation.*—The relation of pigmentation to egg production has been described in Lesson 13. The yellow pigment found in the skin, beak, and shanks of birds of most of our common breeds of poultry comes from certain feeds they eat and, when they are laying, the pigment goes into the egg yolks and that which existed in the body parts fades out. The rate at which the pigment disappears is modified by such factors as the breed, age, size, and health of the hen, the rate at which she is laying, the ingredients in her diet and the condition of the range she runs on. The disappearance of pigment takes place in such definite order from the body parts in which it is found that, with a little experience, one can make a fairly accurate estimate of the bird's past production by noting the degree of bleaching. When laying ceases, the yellow pigment returns in the same order it disappeared and knowing this it is possible to estimate how long a hen has been out of production.

(*d*) *Moult.*—In general, poor layers moult early and spend a long time getting their new coats of feathers while the best layers moult late and the feathers are replaced in a comparatively short time.

(*e*) *Standard requirements.*—*Standard* requirements have been ignored to a considerable extent in breeding and judging utility poultry but size, shape, and colour should not be overlooked. Any bird awarded a prize in an exhibition should approximate breed requirements.

(*f*) *Quality.*—Good quality in laying hens is indicated by a clean-cut head, comb and wattles of medium size for the breed and free from coarseness, a thin and pliable skin, thin and flat shanks that are covered with fine-textured scales, thin pubic bones, and a soft and pliable abdomen.

8. Selecting and shipping utility poultry

Selecting utility poultry for an exhibition should be done with the same care that is used in selecting *Standard* poultry but with emphasis on those factors which have a bearing on the economical production of eggs and meat.

Shipping should be done in the same manner as with *Standard* poultry.

CHICKENS
GRADE A
MILKFED
TAGGED
72

BOX OF DRESSED POULTRY

Graded, packed and stencilled in accordance with Government regulations.

9. Judging dressed poultry

Exhibits of dressed poultry could teach both producers and consumers important lessons regarding what constitutes good quality in poultry meat. They are not very popular, however, because of the expense to both exhibitor and show management in holding a first class show. The exhibitor must kill many more birds than are needed for his entry in order to get the desired uniformity and the management must provide refrigeration to prevent spoilage of exhibits.

A typical show of dressed poultry will provide classes for broilers, roasters, capons, fowl, turkeys, geese, and ducks. This list can be either reduced or extended to meet local requirements. Competition is usually limited to Grade Special Milkfed and Grade A Milkfed in entries of chickens and Grade Special and Grade A in other kinds of poultry. Entries may consist of pairs, standard boxes of 12 birds or, with turkeys and geese, boxes holding 6 birds each.

The Dominion Department of Agriculture score card for box packed poultry follows and contains not only the possible scores for perfection in the five factors considered but also deductions that are to be made for defects.

SCORE CARD FOR BOX PACKED POULTRY

Factor No. 1—Box Material and General Appearance

Possible score for this factor—20 points. In order to allow 20 points for this factor the following qualifications must be met:—

(1) Lumber must be of standard dimension and quality, clean, smooth, and free from knot holes. The ends must be even, uniform and tightly nailed. When the ends and sides are of more than one piece, they must fit evenly and smoothly. The lid must be slatted on both ends to prevent breakage in opening. Slats may be placed on the inside or outside of the box as the packer desires. If on the inside, the sides of the box must be wider than the ends by the depth of the slats in order that the lid will fit evenly. If on the outside, the sides and ends of the box shall be of equal width.

Deductions:

When requirements for this factor are not met, deductions shall be made as follows:—

(*a*) For every square inch of dirt or rough lumber deduct 1 point.

(*b*) For every knot hole of more than $\frac{1}{4}$-inch in diameter deduct 1 point.

(*c*) For uneven or insecurely nailed ends deduct 1 to 3 points.

(*d*) For unslatted lids deduct 1 point for each end.

Factor No. 2—Attractiveness and Neatness of Stencilling

Possible score for this factor—20 points.

In order to allow 20 points for this factor the following qualifications must be met:—

(1) The stencilling must be strictly in accordance with Government regulations.

(2) The letters and figures must be clear and legible. The wording and stencilling must be uniform and properly centred on the end of the box.

(3) The figures showing the net weight, the number of birds and the word "Tagged" must appear where the regulations prescribe.

Deductions:

When requirements for this factor are not met, deductions shall be made as follows:—

(*a*) For every letter or figure smeared or illegible deduct 1 point.

(*b*) For stencilling that varies from the horizontal or is not properly centred deduct 1 to 4 points.

Factor No. 3—Quality and Neatness of Liners

Possible score for this factor—10 points.

In order to allow 10 points for this factor the following qualifications must be met:—

(1) Liners must be of white parchment or white waxed paper, clean and smooth. They must be cut to fit the sides and ends neatly and the inside of the box must be completely covered. They must be folded neatly over the top of the birds.

Deductions:

When requirements for this factor are not met, deductions shall be made as follows:—

(*a*) When liners are unduly wrinkled or have been previously used deduct 1 to 4 points.

(*b*) When liners do not entirely cover the inside of the box deduct 1 to 4 points.

(*c*) When liners are not folded over the top of the birds neatly deduct 1 to 2 points.

Factor No. 4—Neatness of Pack

Possible score for this factor—25 points.

In order to allow 25 points for this factor the following qualifications must be met:—

(1) The birds must be packed in the box of the proper size for their weight.

(2) The necks must be folded back to allow the birds' shoulders to fit closely to the sides of the box.

(3) Each bird must be set squarely in the box and at an angle which places the tips of the shoulders on a level with the top edge of the box.

(4) Wing tips must be hidden.

(5) When packed, the birds must be in alignment and present a uniform neat appearance.

Deductions:

When requirements for this factor are not met, deductions shall be made as follows:

(*a*) With boxes packed with oversized or undersized birds deduct 2 to 5 points.

(*b*) For every bird that is not squarely set up with tips of shoulders on a level with and reasonably close to the sides of the box, deduct 1 to 2 points.

(*c*) For each bird that is out of alignment deduct 1 point.

(*d*) For every wing tip showing deduct 1 point.

Factor No. 5—Uniformity of Size, Colour and Conformation of Birds Within the Box

Possible score for this factor—25 points.

In order to allow 25 points for this factor the following qualifications must be met:

(1) Birds must be uniform in size, colour and conformation.
The bloom and colour must be bright for the grade.
They must be free from freezer burn and hairs.

Deductions:

When requirements for this factor are not met, deductions shall be made as follows:

(*a*) For every bird that varies in colour deduct 1 point.
(*b*) For every bird that varies in size or conformation deduct 1 point.
(*c*) For every bird showing hairs deduct 1 point.
(*d*) For every square inch of freezer burn deduct 2 points.
(*e*) For every bird with dull bloom deduct 1 to 3 points.

10. Selecting and shipping dressed poultry exhibits

The score card given in the preceding section indicates what is required in both poultry and boxes for exhibition entries. It is at once apparent that many more birds must be killed than are needed for the actual exhibit in order to get the uniformity of size, type, colour of skin and finishing that is necessary in a high grade and attractive exhibit. Descriptions of the different grades of poultry and packing weights are contained in the Regulations Respecting the Grading and Marking of Dressed Poultry. These regulations and details regarding boxes for packing poultry are available from the Poultry Marketing Service, Department of Agriculture, Ottawa.

Dressed poultry exhibits should be moved as rapidly as possible from the point of packing to the exhibition. If shipped by truck or express it is advisable to cover the boxes with wrapping paper so that they will be clean and bright when put on display.

LESSON 14

CAPONIZING

Topics for Study

1. Why we caponize.
2. Suitable breeds for caponizing.
3. Age for caponizing.
4. Selection of the birds.
5. Preparation for caponizing.
6. Caponizing instruments.
7. Operating table.
8. Performing the operation.
9. Care after the operation.
10. Results from caponizing.

Caponizing is the operation by which the gonads or testes are removed from cockerel chicks and compares with the well-known farm operation of castration in calves, pigs, and lambs. The art of caponizing has been known for centuries but the practice has never become very general. An attempt is made in this chapter to describe the operation and to tell where results are likely to warrant the cost.

1. Why we caponize

Cockerels are caponized for the same reason that calves, pigs, and sheep are castrated—because, as a result of the operation, a better quality of meat is produced. As cockerels reach maturity there is loss from fighting and the meat becomes tough and stringy because of the activity of the birds. Capons do not fight and are inclined to laziness which favours the production of good quality meat. The increased size of capons is not so important a factor as is generally believed. The operation of caponizing gives the birds a considerable set-back from which it takes them several weeks to recover and at the usual time of marketing they are not greatly heavier than cockerels of the same age.

2. Suitable breeds for caponizing

Most capons are produced from breeds of the American and English classes of poultry and various crosses of these. Birds of the Asiatic breeds produce very large and excellent capons but the comparatively slow rate of multiplication and growth of birds of these breeds removed them long ago from consideration in commercial poultry farming. Under certain conditions it may pay to caponize White Leghorn cockerels, but they do not produce large carcasses and to be grown profitably they must be marketed when about four and a half months old. Barred Plymouth Rocks produce excellent capons and are probably used more for this purpose than any other breed.

3. Age for caponizing

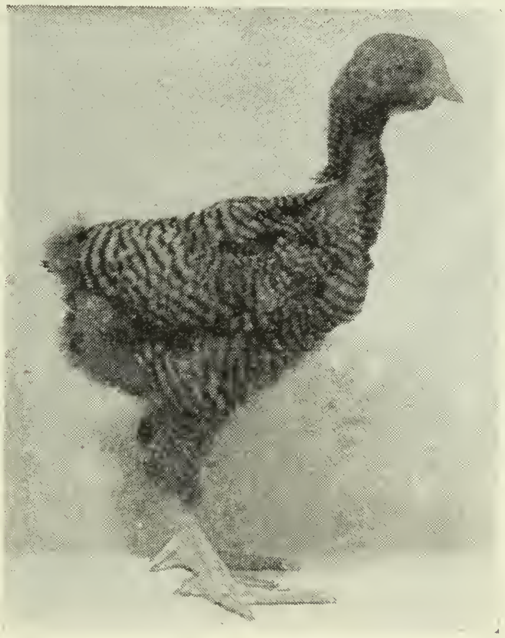
Caponizing instruments of standard size are intended for use with well-grown chicks about five or six weeks of age. At this age the characteristic down of the small chick has usually disappeared and comparatively few feathers have taken its place. This adds to the ease in performing the operation at this time. As the birds grow older, there is more bleeding and caponizing is more difficult. Special small-sized instruments make it possible to perform the operation at three weeks of age but greater skill is required.

TWO-WEEK-OLD COCKEREL

Can be caponized successfully by using small-sized instruments. (Photo, courtesy of Department of Public Relations, Ontario Agricultural College.)

4. Selection of the birds

It is not possible to produce good growthy capons from cull cockerels. Only well-grown, thrifty cockerels that are free of disease should be caponized. Mortality is likely to be heavy during and following the operation among birds that are infected with coccidiosis and colds, bronchitis or other respiratory troubles.



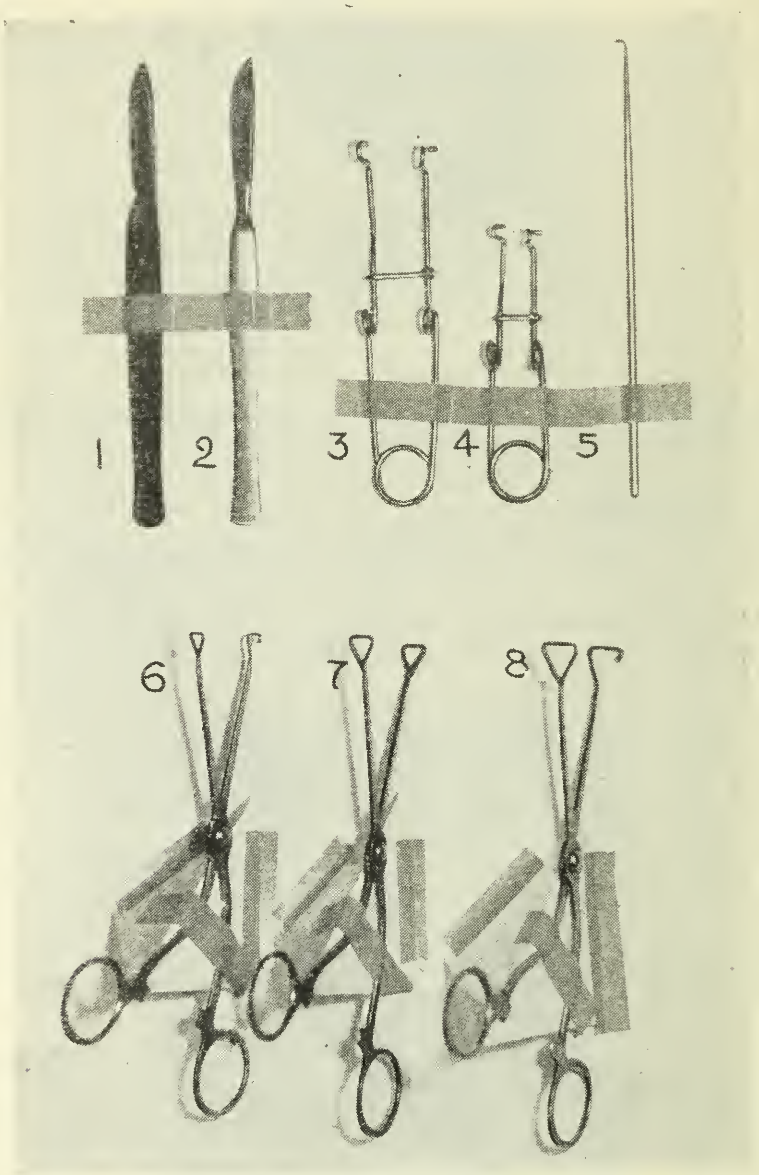
SIX-WEEK-OLD COCKEREL

A popular size for caponizing. (Photo, courtesy of Department of Public Relations, Ontario Agricultural College.)

5. Preparation for caponizing

With healthy birds of the correct age at hand, about the only preparation necessary before caponizing begins is a period of starvation ranging from 12 to 24 hours in length. This period of starvation must be thorough because, under the stress of hunger, chickens will eat things that they would otherwise not touch. Where possible they should be enclosed in crates or battery brooders having wire or slatted floors.

The period of starvation allows the intestines to become emptied of their contents so they occupy less space and permit the operator to have a better view of the internal organs including the testes. From the standpoint of the birds, a short period without food is desirable, but the beginner at caponizing is well advised to allow the longer period mentioned. As he gains experience the period of starvation can be lessened.



CAPONIZING INSTRUMENTS

1. Lance or scalpel.
2. Lance or scalpel.
3. Large-sized spreader.
4. Small-sized spreader.
5. Tearing hook and probe.
6. Small-sized remover.
7. Medium-sized remover.
8. Large-sized remover.

(Photo, courtesy of Department of Public Relations, Ontario Agricultural College.)

6. Caponizing instruments

Caponizing instruments of different makes vary greatly in detail but the more common ones include: a lance or scalpel for making the incision through the skin and flesh; a hook for tearing the membranes which cover the intestines; a probe for pushing the intestines to one side when this is necessary; a spreader which holds the incision open to expose the internal organs to view, and the removers with which the testes are seized and withdrawn. Frequently one instrument provides both hook and probe and a recently invented single instrument performs all the functions of the usual caponizing set. Electric caponizing sets have been on the market for several years. Both lance and removers have an electrical connection and it is claimed for them that they cauterize the tissues with which they come in contact thus resulting in less bleeding and fewer "slips" or imperfectly caponized birds. They are more expensive than ordinary sets and slower in use because of the attached cords and the time required to heat the element in the remover each time it is used.

7. Operating table

Where only a few cockerels are to be caponized, an ordinary barrel makes a fairly satisfactory operating table. It has the disadvantage that the barrel head cannot be tilted to get the best lighting as the sun moves across the sky.. A simple contrivance consisting of two pieces of board 12 inches wide and 16 or 18 inches long hinged together at one end and placed on top of the barrel will overcome this difficulty. By inserting a small stick between the two boards, the upper one may easily be adjusted to any desired angle.

The professional operator may want a more elaborate table that is adjustable for both height and position and perhaps with a revolving top holding three or four birds at one time.

8. Performing the operation

Details in performing the operation will vary with different makes of instruments and with different operators. Those listed here are typical but are not offered in a dogmatic manner. Each operator should work out a satisfactory routine and by following it he will gain speed with experience.

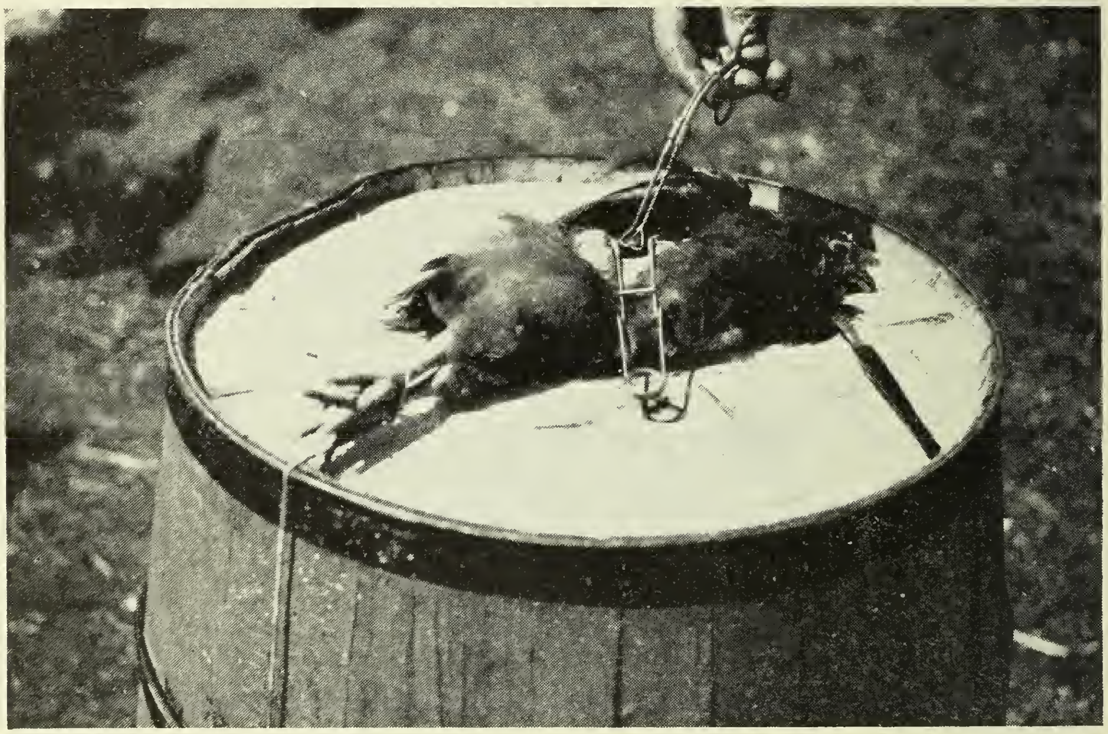
(*a*) *Good light is essential.* It is practically impossible to caponize with any degree of satisfaction unless the operator has a good working light. The work can be done best out of doors on a clear day although too brilliant sunshine may make too great a contrast between sunlight and shadow for the easiest work. It is often possible on a clear day to work inside a south or west window with a good degree of success. Artificial light can be used but, when placed right for visibility, is likely to produce heat that is uncomfortable to the operator. Sometimes a small battery-lighted lamp, which can be fastened to the forehead in such a way that a beam of light is thrown in the direction the operator is looking, is used very satisfactorily.

(*b*) *Disinfectant.* The use of a mild disinfecting solution to sterilize the instruments and the skin of the bird in the area in which the incision is made is often recommended. This is a good precaution and the same solution can be used to dampen and hold in place any feathers which may otherwise be in the way during the operation. In practice, the use of the disinfectant is often omitted because it takes time and results have shown that wound infection seldom follows this operation.

(*c*) *Securing the bird.* The bird must be securely held on the table during the operation. This is usually done by the use of weights which are fastened to the legs and wings by means of cords. The weights can be of iron or lead, the chief essential being that they have the required weight without too much bulk. One pound weights are satisfactory for five- or six-week-old chickens. It is usual to have each weight permanently attached to one end of the cord, while on the other end is a noose or hook which permits quick and easy attachment to the wings or legs of the chick. Locating and holding the bird in a convenient position for operating will be easier if finishing nails are driven into the edges of the uppermost board in the operating table already described at about two-inch intervals and with the heads extending about one inch. Where it is possible to have two or three attendants, the work can be greatly speeded up by dispensing with cords and weights and having each attendant hold the bird he brings to the operator on the table while the operation is being performed.

(*d*) *Removing the feathers.* Unlike other farm animals, the testes of the chicken are located within the body cavity and in caponizing they are removed through an incision in front of the thigh. Any feathers in the immediate area should be pulled out and surrounding ones can be dampened to keep them out of the way if this seems necessary.

(*e*) *Making the incision.* The operation can be performed most easily and with the least danger of loss if the incision is made between the hindmost two ribs. It is possible to remove the testes if, in error, the incision is made either behind the last rib or in front of the second to last rib. In the case of the former there is more danger of cutting the thigh muscle or the kidney than if the incision is made in the proper place and there is no rib to support the back leg of the spreader when it is put in place. In the latter case removal of the testes is more difficult and there is danger of cutting the lung tissue. The ribs can often be seen quite plainly in five- or six-week old cockerels but if indistinct they can be located easily with the forefinger of the left hand.



PERFORMING THE OPERATION

Note barrel being used for operating table, the bird securely held by cords and weights, the spreader in place between the ribs and the testis grasped between the jaws of the remover.

When the proper space between the ribs has been located, the skin is drawn either forward or towards the thigh so that incisions through skin and flesh will not be exactly opposite. With the skin thus held taut with the left hand, a cut is made beginning about three-quarters of an inch from the back bone and following the curve of the ribs to a length of about three-quarters of an inch. With practice this incision can be made with a single bold stroke of the lance and with little danger of injuring the intestines or other internal organs.

Birds vary considerably in body type and the manner in which they are fastened on the table may magnify existing differences. With some, the incision will be far enough from the thigh muscle that there will be no danger of cutting it but with others it may be necessary to crowd the muscle back with the left forefinger to avoid injuring it.

(*f*) *Inserting the spreader.* After the incision is made, it is kept open by inserting the spreader which is designed for this specific purpose. In some cases it is now possible to see the internal organs but in others it is necessary to use the tearing hook to make an opening through the air sac wall.

(*g*) *Removing the testes.* The testes lie close to the back of the chicken, one being near the forward end of each kidney. In chickens five or six weeks old they somewhat resemble grains of barley in size and shape. In birds of most breeds they are pale yellow in colour but with Barred Plymouth Rocks it is not unusual to find them almost black or with varying proportions of black and yellow.

The testis which is uppermost can usually be seen when the bird has been well starved, the incision made and the spreader inserted as already described. If there has been insufficient starving, it may be necessary to gently press the intestines downward with the probe to uncover the testis. The second organ lies directly below the upper one, but is usually hidden by the back bone or covering membranes.

Beginners usually find it much easier to remove only the upper testis through the first incision. They then turn the bird over on the table without removing the cords and weights from legs and wings, make a second incision in the opposite side from the first and remove the second testis. Some experts at caponizing always make two incisions and one of the most recently invented removers is designed for this manner of removal. In the actual removal, the testis is grasped with the jaws of the remover taking care that tissue containing arteries is not included. Some removers have provision for locking the jaws after the testis has been grasped but with experience one will learn how much pressure to apply with the fingers to firmly hold the testis in the remover and thus the locking and unlocking of the spreader can be dispensed with. Once grasped by the remover, the testis is firmly withdrawn, sometimes, though not necessarily with a gentle twisting motion, bringing with it the attached cord. The second testis is then removed in the same manner through the second incision. If only a small part of one testis or its attachment is left within the body the bird takes on the appearance of a cockerel as it develops and is known as a "slip". Slips cannot be sold as capons although they often give better quality meat than cockerels. In careful caponizing, the percentage of slips should not be great.

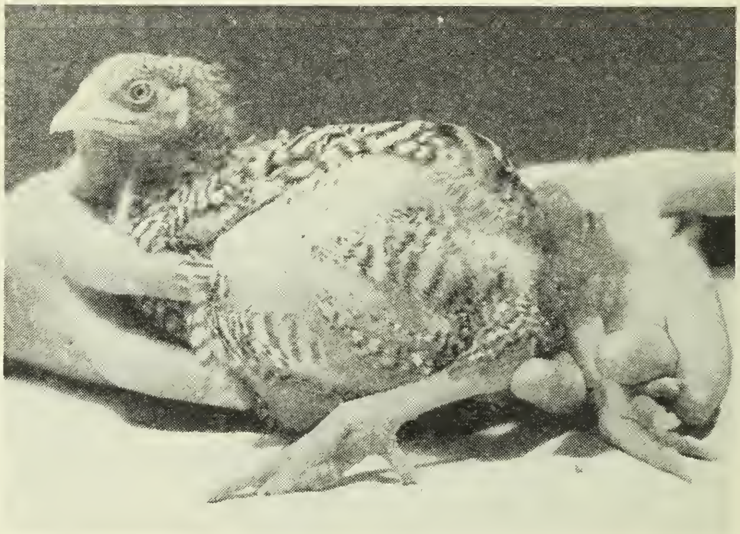
When both testes are removed through one incision, the lower one should be removed first because if taken in the reverse order it will be difficult to locate the lower organ if any bleeding should occur from the removal of the upper one. Beginners find it difficult to learn the knack of grasping the lower testis. It lies beneath the back bone and cannot always be seen. It must be drawn towards the operator with the removers and grasped just as it is about to slide over their ends. It is then withdrawn as described above and the upper testis removed immediately. The person trained in operating through one incision can perform the operation more quickly than when two are made, but there is a little greater danger of bleeding.

Bleeding is the greatest danger in caponizing. The testes lie close to large arteries and if these are ruptured the bird will bleed to death very quickly. Smaller blood vessels in the membrane connecting the intestines may also be ruptured and make location of the testes difficult although seldom causing the death of the bird. There is also a large vein of the skin which is sometimes cut when making the incision. This can be avoided with care and when it does happen is unlikely to produce fatal results. Mortality during the operation need not be great.

When the operation has been completed the bird is released and preferably placed in a reasonably warm building where it will remain quiet for several days. Birds should be handled carefully after the operation so that there will be a minimum of struggling and fluttering.

9. Care after the operation

It is important that caponized chicks should be kept warm. They feel the cold more than usual after the operation and are inclined to huddle or crowd which may result in loss. In some cases it may be advisable to supply heat for the first few nights. If there are roosts in the building in which the birds have been placed, these should be removed and the birds forced to rest on the floor. This will prevent their flying which may hinder the healing of the incision.



WIND PUFF

Only in extreme cases is treatment required to reduce wind puffs. (Photo, courtesy of Department of Public Relations, Ontario Agricultural College.)

The birds will show a desire for food immediately after the operation and feeding may begin at once. The customary method of feeding may be resumed although some think it is advisable to give a moist mash for the first few days.

Healing of the incision takes place at a remarkably rapid rate. Within two or three hours a scab will have formed over the incision through the skin. Several days will elapse before the flesh under the skin heals and until it does there is a tendency for air, from the air sacs punctured during the operation, to form as puffs beneath the flesh and the skin. No treatment is necessary for most cases of "wind puffs" but a few birds may take on a balloon-like appearance and show difficulty in walking. Relief can be given in such cases by puncturing the skin with a small knife blade and letting the air escape. Several treatments of this nature are sometimes necessary.

10. Results from caponizing

The capon becomes a "sissy" in both looks and actions. The large red comb and wattles and strutting bravado so prominent in the cockerel are lacking in the capon. The comb and wattles remain small in size and pale in colour and the feathers of the neck and saddle become long and silky. Capons neither crow nor fight and can even be taught to "mother" chicks.

Experimental exidence does not bear out the more extravagant claims which have been made regarding the faster growth of capons as compared with cockerels. For several weeks after the operation, capons will be lighter in weight than cockerels of the same age because of the set-back they receive. Figures from the Dominion Experimental Farm at Ottawa quoted in the growth table in Lesson 7 show capons to be only slightly heavier than cockerels at 26 weeks of age. Capons do continue to grow after the age that cockerels cease growing, but the weight added after the twenty-sixth week usually costs more than the increased value of the carcass.

Because of their more quiet disposition, capons fatten better and produce a better quality of meat than cockerels. The high quality of meat is retained to a greater age than with cockerels. Dressed capons will grade better than cockerels and many markets will pay a premium of from one to three cents a pound for the meat.

Whether or not caponizing is profitable will depend on circumstances. It is an added expenditure to the poultryman, there are some losses during the operation and the birds require special care after the operation. There is nothing to be gained in caponizing cockerels that are to be killed at broiler age. With roasters, there will be less loss from fighting than with cockerels, greater ease in fattening, better quality meat, better grading, and in many cases a better price. In the production of high grade roasting chickens, more caponizing could be done than at present to the advantage of both producer and consumer.

LESSON 15

PRODUCING AND MARKETING QUALITY EGGS

Topics for Study

1. Breeding for egg quality.
2. Feeding for egg quality.
3. Producing clean eggs.
4. Producing infertile eggs.
5. Gathering eggs.
6. Cleaning eggs.
7. Holding eggs.
8. Grading eggs.
9. Packing eggs.
10. Methods of marketing eggs.
11. Storing eggs.
12. Processing eggs.
13. Oiling eggs.

Eggs at their best are one of the choicest food products. They are never better for human consumption than when first laid. It does not follow, however, that all new laid eggs are of the highest quality, because an occasional one is laid that is unfit for human consumption and many are laid that are not of the highest quality. The quality of eggs may be very easily affected by the management of the flock and the conditions under which the eggs are kept after being laid. Consumers are quick to detect poor quality in eggs and turn to other food products when egg quality is disappointing. Consequently the marketing of first grade eggs is a matter of greatest importance to the poultryman.

1. Breeding for egg quality

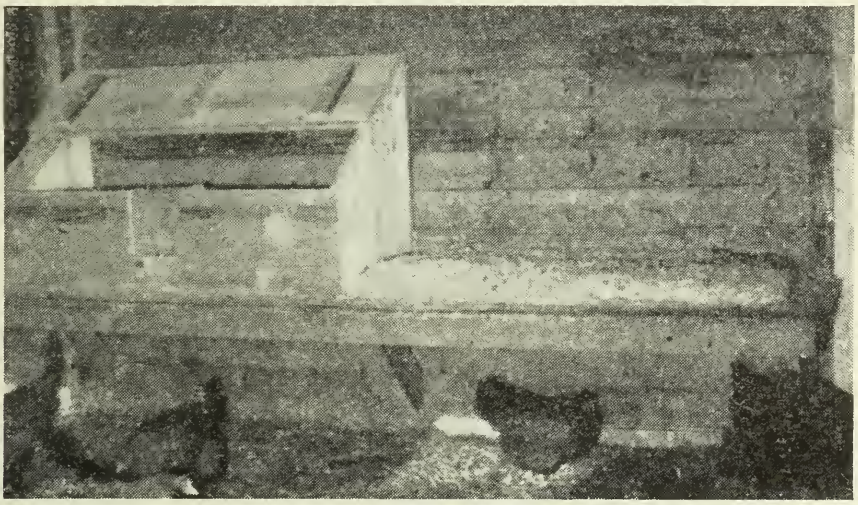
Fundamental improvement in egg quality begins with the breeding stock. Such factors as egg size, shape and colour are known to be inherited. Interior quality is also inherited to some extent. Selection for the last-named factor is work which must be done by specialists in breeding, but the culling of birds which lay eggs of poor size, shape and colour from breeding flocks can be easily done by any flock owner who is able to trapnest his birds for a few days during the year.

2. Feeding for egg quality

The size of eggs, shell strength, yolk colour, quality of white or albumen and the flavour are influenced by the feed given. As far as is known, there are no special feeds which will improve the flavour of normal eggs, but a few food products such as cottonseed meal and certain plants that may be found on the range including shepherd's purse, rape, onions, and garlic have a decidedly harmful effect on either the colour or the flavour of the egg yolks. Care should be taken to see that laying hens do not have access to these. Oyster or clam shells or other shell-making material should always be available to the birds so that they will have lime in a quickly available form for the production of strong shells. An adequate supply of vitamins is also believed to be a factor in producing strong-shelled eggs.

3. Producing clean eggs

One major cause of dirty eggs is hens soiling those that are in the nests when they enter them. Much of this soiling can be prevented by supplying a sufficient number of nests and by practising management which prevents the hens having wet, dirty feet when they enter the nests. There should be one nest for every five or six hens, with the nesting material renewed often enough to keep it clean. The laying house floors should be well covered with litter which must be kept as dry as possible. When the range is muddy, the hens should be kept in the house until the day's output of eggs has been laid. Covering dropping boards and pits with wire netting, so that the hens are excluded, will aid in this regard. Eggs are sold largely on appearance, so every effort should be made to keep them spotlessly clean.



EASILY CLEANED NEST

Left, top of nest in place. Right, top of nest removed showing clean litter on nest floor. (Photo, courtesy of Dominion Experimental Station, Swift Current, Sask.)

4. Producing infertile eggs

The development of the germ in an egg will begin at a temperature of 70 degrees F., and when the temperature rises above this point the rate of development greatly increases. On summer days the development may be enough to considerably lower the quality of the eggs if they are not gathered frequently and promptly placed in a cool room. Infertile eggs do not deteriorate so quickly as those which are fertile, so much better quality eggs will be produced if the males are removed from the breeding pens as soon as the breeding season is over. It is particularly important that eggs should be infertile during hot weather.

5. Gathering eggs

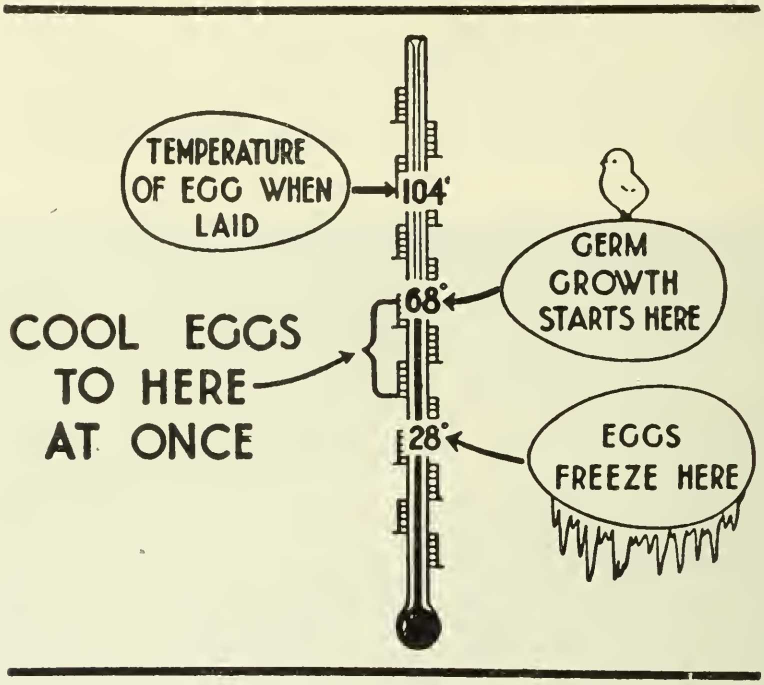
Eggs should be gathered frequently in hot weather to avoid their becoming overheated and in cold weather to prevent freezing. When gathered frequently, fewer eggs will become soiled or broken. Pails or baskets are suitable containers for collecting eggs in small flocks, but the specially made wire egg baskets are more satisfactory for large flocks because they permit a more rapid cooling of the eggs.

6. Cleaning eggs

Cleaning eggs is no substitute for producing clean eggs. If eggs are very dirty or stained, no type of cleaning can do a satisfactory job. Any type of cleaning removes, to some extent, the protective coating of the shell and hastens quality deterioration. The use of water for cleaning tends to carry bacteria and moulds into the egg meat and hastens spoilage.

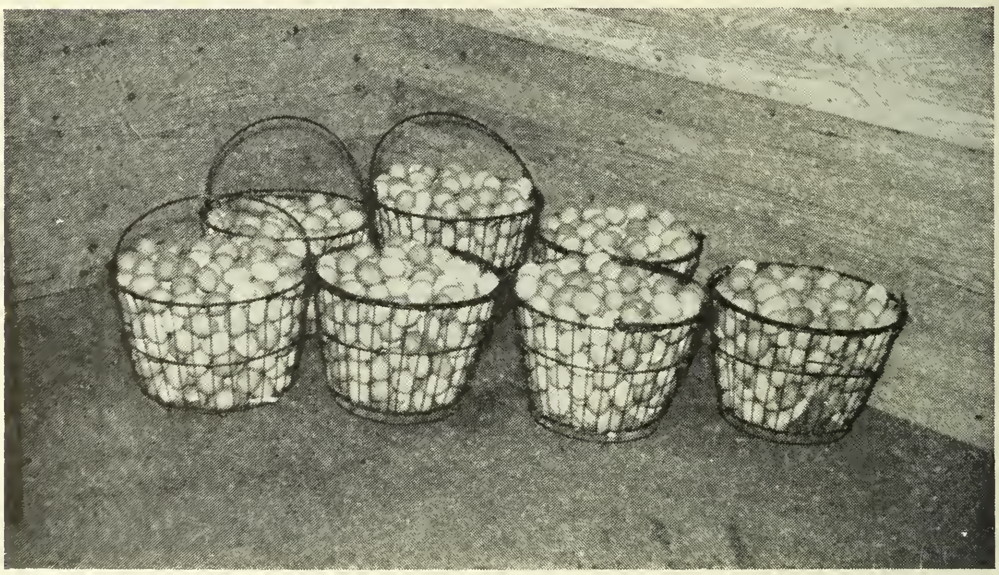
It is a waste of time to attempt to clean very dirty eggs. Eggs with small spots of dirt or stain may be cleaned by the use of a fine abrasive material such as emery paper, but this should be applied only to the section of the shell containing the actual dirt or stain.

The use of cleaning machines, whether on the washing or abrasive principle, is not recommended.


TEMPERATURE OF EGG WHEN LAID
104°
GERM GROWTH STARTS HERE
68°
COOL EGGS TO HERE AT ONCE
28°
EGGS FREEZE HERE

CORRECT HOLDING TEMPERATURES FOR EGGS

(Chart from U. S. Department of Agriculture and courtesy of Department of Public Relations, Ontario Agricultural College.)



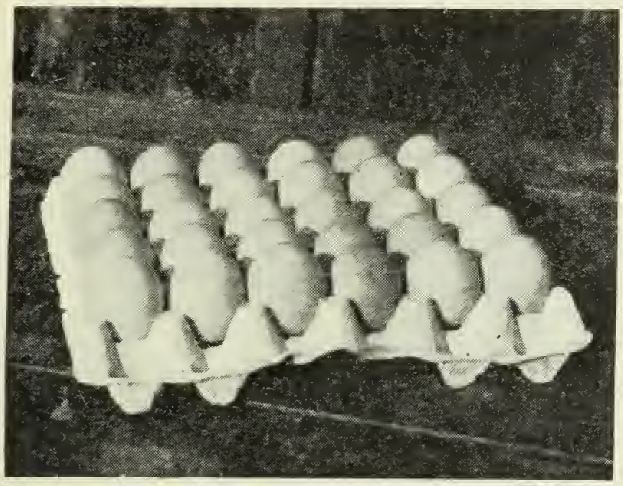
COOLING EGGS

Here eggs are being cooled in wire baskets on the floor of an insulated egg room.

7. Holding eggs

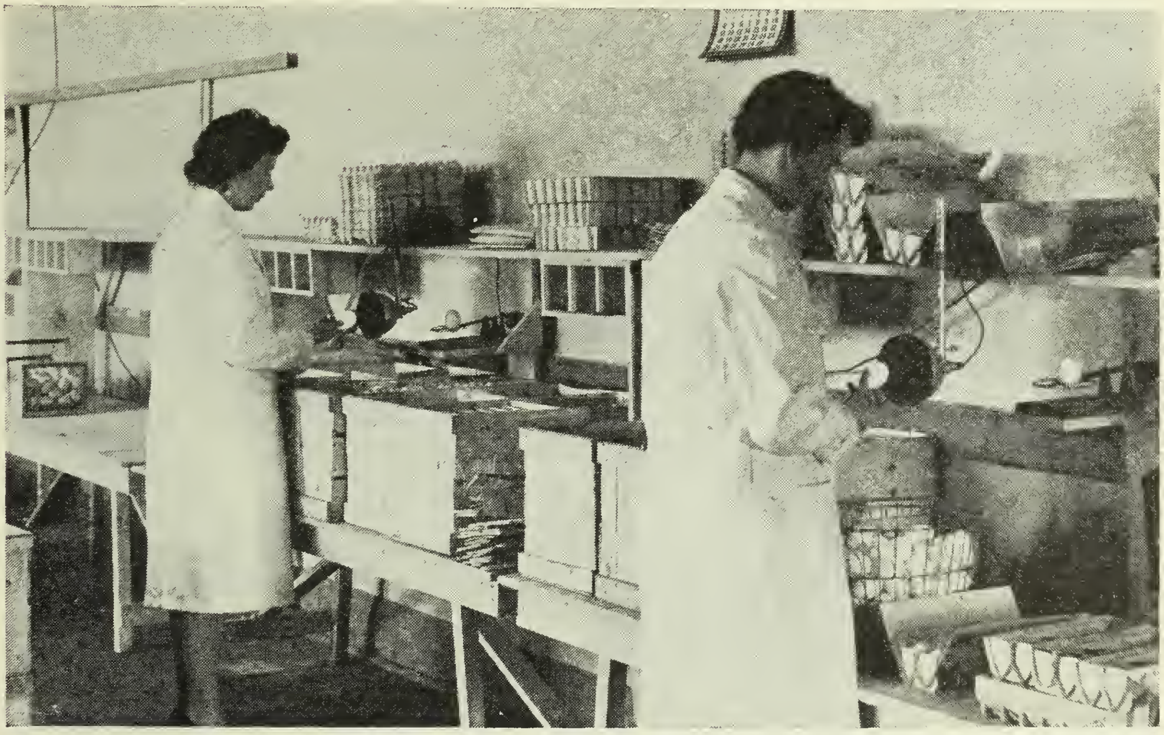
As soon as the eggs are collected they should be taken to a cool, clean room, with a temperature between 55 and 65 degrees F. They should be left there in the wire collection baskets (if these are used) or laid out on trays, for approximately 12 hours to permit them to cool out thoroughly. Only after this, should they be packed in shipping cases.

Under no circumstances should they be kept on the farm more than a week before marketing, and more frequent marketing is desirable.



EGGS IN MOULDED PULP TRAY

After being cooled, eggs may be held in trays such as this either within or outside cases.



CANDLING ROOM

Note the special candling lamp before each grader and scale for checking egg weights. (Photo, courtesy of Department of Public Relations, Ontario Agricultural College.)

8. Grading eggs

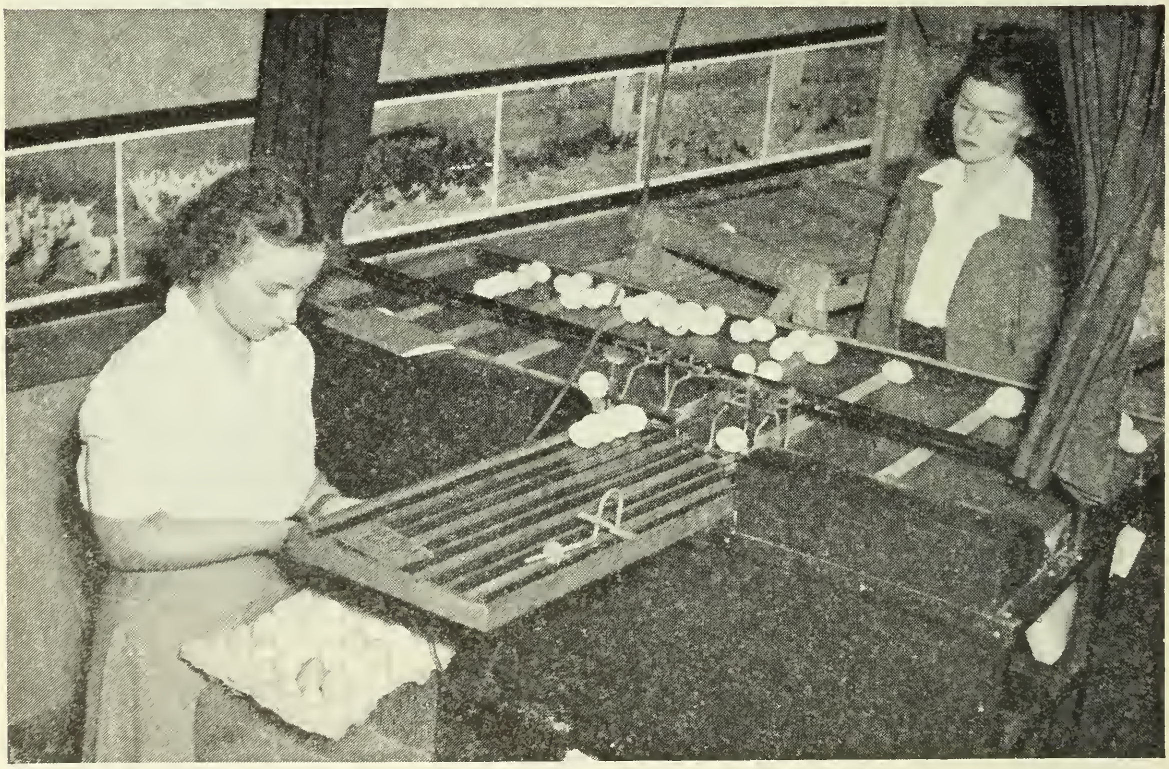
The sale of eggs on a graded basis began in Canada in 1923 and is now the accepted practice wherever eggs are handled in commercial quantities. Grading can be done either by poultry producers or in egg grading stations which are required to possess a certificate of registration from the Dominion Department of Agriculture. In registered egg grading stations, the arrangement of the premises, the grading equipment and facilities for temperature control must comply with specific standards established under regulations. Grading is done by or under the direction of persons who have been approved by the Dominion Department of Agriculture.

In grading eggs, consideration is given to the four following factors:

(*a*) Quality factor, as determined by candling.
(*b*) Weight factor.
(*c*) Appearance factor, as determined by the degree of cleanness.
(*d*) Shell factor, as determined by soundness and construction of shell.

The "Regulations Respecting the Grading, Packing and Marking of Eggs" are revised from time to time as conditions warrant and any person interested in egg grading should get a copy of the latest revision from the Senior Poultry Products Inspector in the province in which he is living or from the Poultry Marketing Service, Department of Agriculture, Ottawa. These regulations describe in detail:

(*a*) Egg grades.
(*b*) Grading premises and equipment.
(*c*) Packing materials.
(*d*) Grade markings.
(*e*) Shipment.
(*f*) Inspection
(*g*) Detention.
(*h*) Wholesale and retail distribution.
(*i*) Shipment and purchase of ungraded eggs.

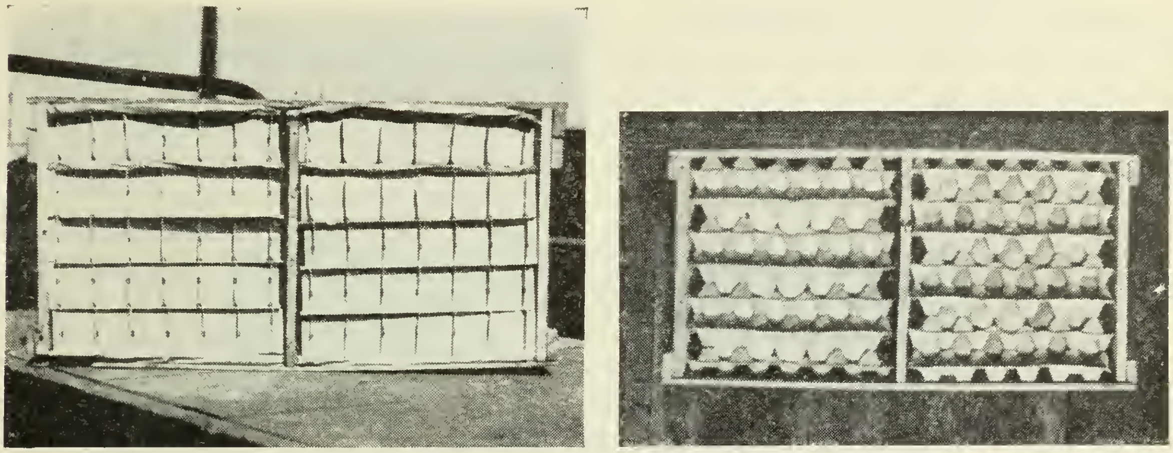


EGG GRADING MACHINE

This machine sorts the different grades according to weight. (Photo, courtesy of Department of Public Relations, Ontario Agricultural College.)

9. Packing eggs

Standard egg cases contain 30 dozen eggs and are divided into two compartments holding 15 dozen each. Either honeycomb fillers, flats and excelsior pads or moulded pulp trays may be used to hold and protect the eggs. The honey-comb fillers hold 3 dozen eggs to a layer and 5 layers to a half-case, while moulded trays hold 2½ dozen eggs and 6 layers to a half-case. The extra layer when packed in moulded trays is made possible by the fact that the eggs stand in a staggered position and not directly on top of one another.



CASES WITH SIDES REMOVED

Left, five layers or tiers of eggs in honey-comb fillers. Right, six tiers in moulded pulp trays. Each case holds 30 dozen eggs.

Special, heavy wood cases, known as "road cases" should be used by producers for marketing their eggs. These cases are made of thicker lumber than that used in ordinary commercial egg cases. For that reason they are more durable and better able to protect the eggs during marketing. They also have a "lock top" lid which will last as long as the case. These "road cases" can usually be secured in both 15- and 30-dozen sizes which gives producers the opportunity to buy the sizes best suited to the size of their flocks and eliminates the use of less satisfactory pails and baskets.

CANADIAN EGGS
MARITIME

STANDARD EGG CASES

Left, eggs packed in honey-comb fillers. Right, eggs packed in cartons.

For wholesale trade, egg cases may be either wood or corrugated board and specifications for both are given in the "Regulations" mentioned in Section 8. For retail trade, cartons holding one dozen eggs each are very desirable although their use adds from one to two cents a dozen to the cost and increases the amount of labour in preparing the eggs for market. Cartons are so made that they fit in all ordinary egg cases without affecting their capacity.

Dusty packing material is a common source of soiling eggs so it is important that clean, sound fillers, flats and trays should always be used for packing eggs. Eggs should always be packed with the large end uppermost. Those that are extremely long or oversized should not be placed in commercial containers because they are likely to become broken.

10. Methods of marketing eggs

A producer can sell his eggs in two basic ways. He can grade them himself and sell them as graded eggs to consumers, retail stores, restaurants, etc., or he can deliver them as ungraded eggs to a registered egg grading station or a first receiver. Registered egg grading stations may be either privately owned businesses or they may be operated by producers' co-operatives.

The decision whether to dispose of his eggs to retailers or consumers, or to sell them commercially to an egg grading station must rest with the individual producer. Direct selling involves the time and expense in grading the eggs, in taking them to the city and in making deliveries. The additional money which can be obtained by this method of selling must be measured against the additional cost involved and against the value of the time lost in making deliveries. One necessity in direct selling is that the producer must live reasonably close to the market he serves. If the eggs are delivered to a registered egg grading station, they are graded at that station and the producer is paid according to the grade of his eggs. If they are delivered to a first receiver (usually a country merchant) he disposes of them to a registered egg grading station and makes payment to the producer on the basis of the grading statement returned from the station.

11. Storing eggs

The storage of eggs became popular because, in the past, egg production was largely seasonal in nature, being greatest during the spring months and lowest during the fall and early winter. Earlier hatching and improved feeding and management have greatly reduced the necessity for long-term storing and since 1941 there has been no commercial storing of eggs for the Canadian market.

When eggs are stored commercially they are packed in cases and held in rooms in which the temperature is kept at or near 30 degrees F. by mechanical refrigeration. For home storage, waterglass, limewater and other products are used. Eggs should be candled before being stored in this manner so that any with cracked shells, blood spots and other serious defects will not be included. Stored eggs are more desirable for baking than as breakfast eggs.

12. Processing eggs

Eggs are processed by drying and by freezing.

(*a*) *Drying.*—The drying of eggs has been practised for many years, the product being used mainly by the baking trade. This method of holding eggs came into prominence in Canada in 1942 when it was adopted as a means of conserving shipping space in transporting eggs to Great Britain under wartime conditions. The inclusion of sugar in the liquid egg before drying, to form "sugar dried eggs", is a recent development.

(*b*) *Freezing.*—Frozen eggs are also used mainly by the baking trade. Prior to freezing, the eggs are broken and either separated into whites and yolks or the two are mixed together. After freezing the product is kept in cold storage until wanted for use.

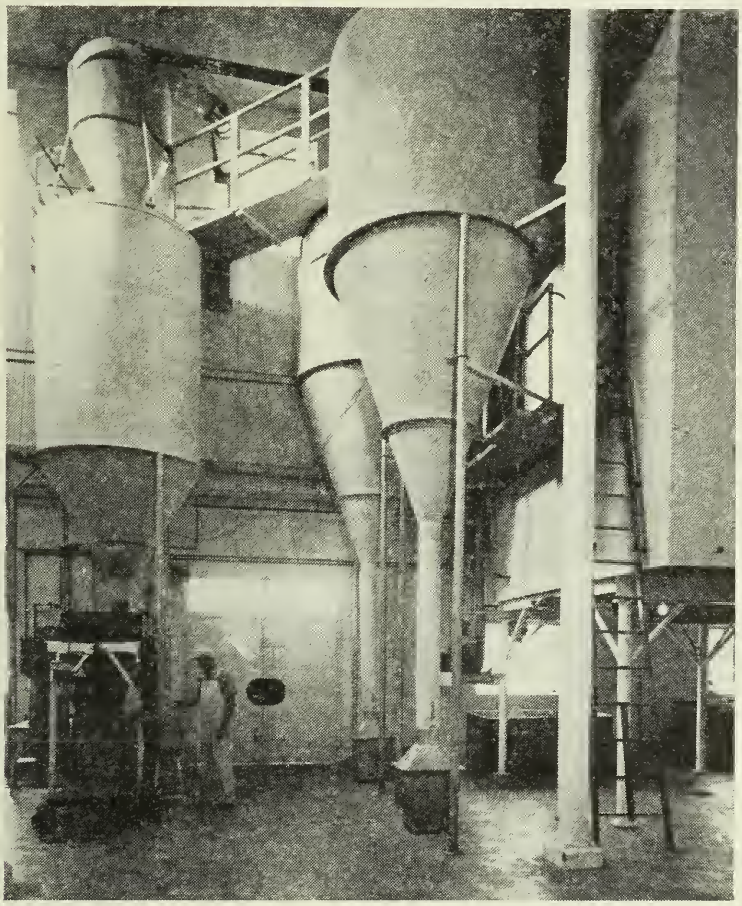
13. Oiling eggs

Quality deterioration in eggs is due to two basic causes. One is concerned with the loss of water; the other with the loss of carbon dioxide.

The water in an egg evaporates gradually through the pores of the shell. As this action progresses the air cell increases in size and the egg loses weight.

When an egg is laid, the albumen contains considerable carbon dioxide. Immediately after laying the carbon dioxide starts to pass out of the egg through the pores of the shell. The loss of this carbon dioxide eventually sets up chemical reactions which lead to a breaking down of the thick albumen.

The loss of water and carbon dioxide can be largely prevented by sealing the pores of the shell. Wax, lard, waterglass, etc., all serve this purpose, but these are used only on a small scale. In large commercial operations the same purpose is achieved by dipping the eggs in an odourless, colourless, mineral oil. This oil seals the pores and, when dry, leaves the shell with an almost normal appearance.



EGG DRYING PLANT

This picture shows part of the equipment used in producing egg powder.

Oiling eggs before storage is now common and the process is also used extensively on eggs being shipped to the Yukon and Northwest Territories. While farm oiling has not been followed extensively, oiling is most effective if done as soon a possible after the eggs are laid. Some commercial firms are encouraging their farm suppliers to adopt the practice. The care necessary in the operation has some restrictive influence in this development.

LESSON 16

MARKETING POULTRY

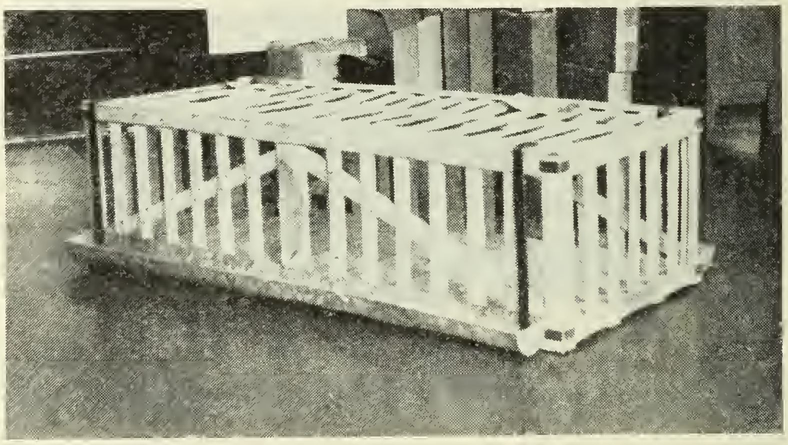
Topics for Study

1. Selling live vs. dressed poultry.
2. Methods of fattening.
3. The fattening quarters.
4. Selecting birds for fattening.
5. Feeding for fattening.
6. Killing poultry for market.
7. Plucking poultry.
8. Cooling.
9. Evisceration.
10. Packing poultry.

Methods of preparing poultry for market are changing so rapidly that what is written today may be out of date tomorrow. Discussion of this subject is, therefore, largely a description of trends at the present time.

1. Selling live vs. dressed poultry

Among the changes taking place in poultry marketing, it is very noticeable that today a smaller percentage of poultry is being killed on farms and more is being done in processing plants which have sprung up in the poultry producing areas across Canada. The more modern of these are highly mechanized and have a daily capacity running up to thousands of birds. Processing plants have removed much of the old time drudgery of preparing poultry for market from farms and left the poultrymen free to produce on a larger scale than was formerly possible. Poultry is trucked alive from farms to the processing plants which may be fifty miles or more from the point of production. Birds so moved are carried in crates of convenient size for handling and holding from 15 to 25 birds each.



LIVE POULTRY SHIPPING CRATE

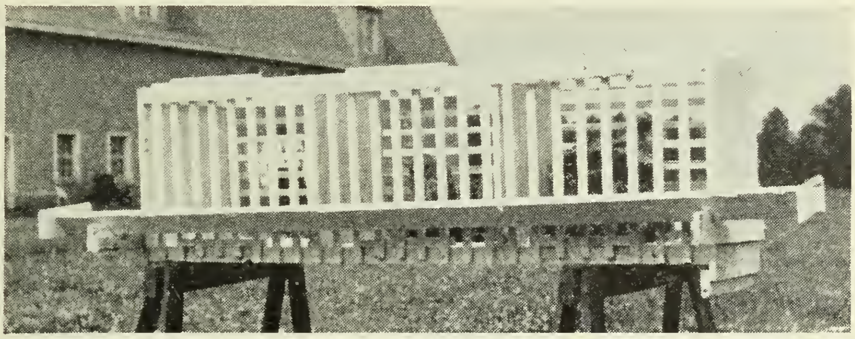
Note the removable feeding trough on the outside.

For the long-distance shipment of live birds, railway cars with built-in compartments equipped with feeding troughs are used. Shipments of this nature should be so timed that they will not reach their destinations on Saturday afternoons, Sundays or holidays. Crate fattened birds, particularly if milkfed, will shrink heavily when shipped long distances.

2. Methods of fattening

Range, pen, and crate fattening are the three methods commonly used in Canada. Cramming may be a useful method for experimental feeding but is not a recognized farm practice.

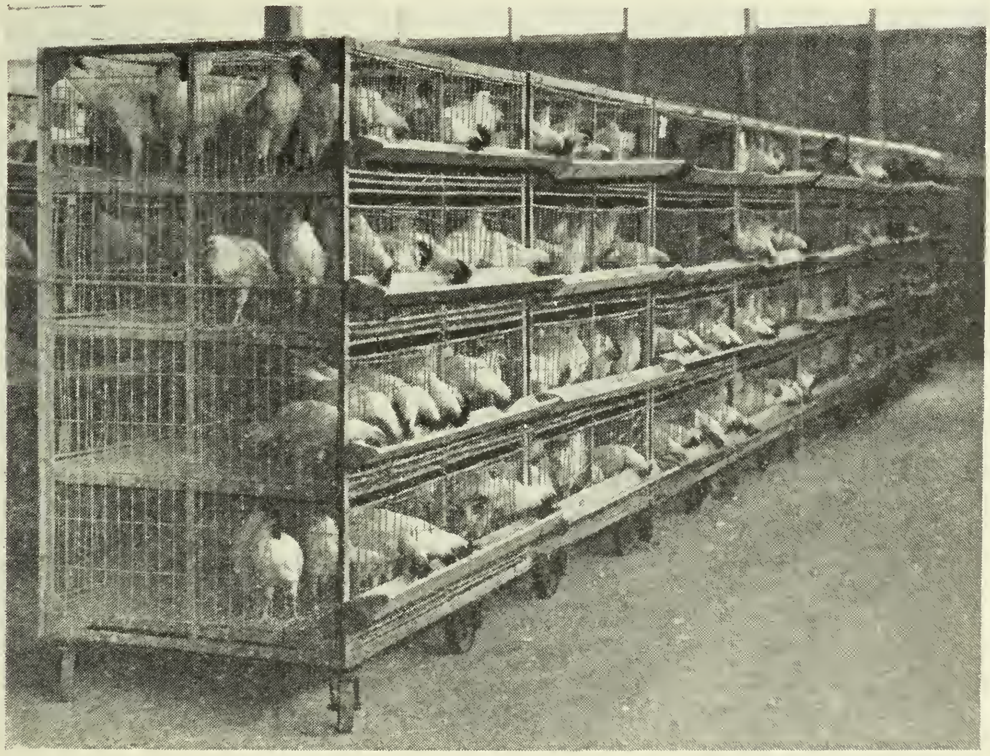
(*a*) *Range fattening* is the common practice with turkeys and geese and is sometimes used for capons also. It is not a satisfactory method for fattening chickens or fowl.



FATTENING CRATE

A suitable type for farm use.

(*b*) *Pen fattening* is quite extensively used in preparing chickens for market. The quality of meat may not be quite as high as with crate fattening and there is likely to be more loss from fighting. Less labour is required than with crate fattening.



FATTENING BATTERIES

This type of equipment is used in large fattening establishments.

(*c*) *Crate fattening* calls for a considerable expenditure of time and more space and equipment than pen fattening but, at best, it produces meat of slightly higher quality.

(*d*) *Cramming* consists of forcing food into the crops of the birds either with the use of a cramming machine or, in the case of noodles, by hand. This method produces meat of excellent quality, but has the disadvantage that the birds must be handled individually at each feeding.

3. The fattening quarters

No special fattening quarters are required when the birds are fattened on range. When fattened in crates, they are usually, although not always, housed and when fattened by cramming, the birds must be kept in crates, pens or small yards so that they may be caught easily. Birds will fatten well under a wide range of temperature conditions but extremes of heat and cold should be avoided. For pen or crate fattening, a partially darkened room is desirable since the birds are less active under these conditions.

(*a*) For *pen fattening* the birds are simply kept in a dry, well-bedded pen with a floor space allowance of about two square feet per bird, which is about half that given laying hens. There will be less loss from fighting in pens holding not more than 20 or 25 birds.

(*b*) With *crate fattening* the birds are enclosed in crates which greatly restrict their movements. A suitable size of crate for farm use is 6 feet long, 2 feet wide and 18 inches high. These are slatted on the sides, top, and bottom. The ends are solid and the two partitions, which divide the crate into three compartments, may be solid or slatted horizontally. On the front side, the slats are placed vertically so that the birds can reach between them to eat from a trough held in place by brackets. The crates may be tiered or decked when necessary. Where fattening is done on an extensive scale it is advisable to use batteries of metal construction which are mounted on small wheels for convenience in moving.

4. Selecting birds for fattening

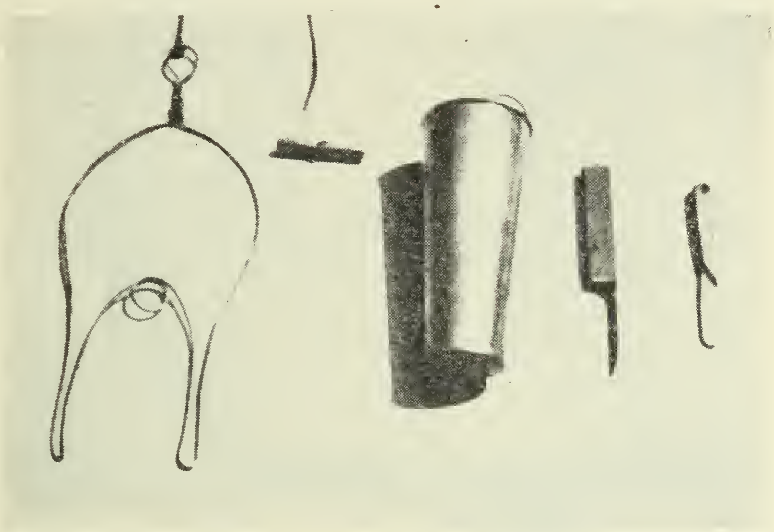
Hens which have been fed for egg production may not need many days of special fattening, but if the best bloom is to be obtained they will require some special feeding. Capons, if well fed throughout the growing period, should be in good flesh at the conclusion of the period and comparatively little fattening is required. Cockerels and pullets are more active than capons and it is mainly with them that fattening is a special problem. With them, a fattening period before slaughter is of value at any stage of growth, but best results are secured when the birds are approaching maturity which will be at about five or six months of age with American and English breeds. With turkeys, maturity is also an important factor in finishing for market.

A recommendation frequently made is that only strong vigorous birds should be selected for fattening. It is true that such birds make the most satisfactory gains, but the flock owner usually has some less vigorous individuals which must also be marketed. They too will usually make some gain in weight and the quality of the meat will be improved by putting them through the finishing process. It is good practice, however, to separate the birds being fattened according to their development.

5. Feeding for fattening

Details for fattening mixtures are given in Lesson 10. Usually the diet consists of three ground grains or grain by-products which are mixed to a batter-like consistency with skim-milk or buttermilk and given in two or three daily feedings. The milk in the diet produces a tender, juicy meat but birds so fed shrink heavily when shipped alive.

Cornmeal, ground barley, ground oats, ground wheat and middlings are basic ingredients for fattening mixtures. Cornmeal, when produced from yellow corn, produces a yellow fat and skin which debars birds from the "milkfed" class under Canadian standards for dressed poultry. White corn, while not so generally available as yellow, has the same desirable fattening qualities and does not produce a yellow skin and fat. Ground buckwheat is another desirable fattening feed, but is not so generally available as the other feeding stuffs named.



EQUIPMENT FOR KILLING ON FARMS

Left to right. Shackle, block and cord, blood cup, sticking knife and pinning knife.

The length of the finishing period will average about two weeks. Feed should be withheld the day the birds are placed in the crates or pen and light feedings only given on the following day. After the second day, the amount of feed can be increased gradually. The change from range conditions to the restrictions of the fattening pen or crate, accompanied by the change from hard grain feeding to the feeding of a sloppy mash, is a heavy strain on the constitutions of the birds, so feeding must be done carefully until they become acquainted with the new diet. Good feeding requires the giving of enough food to satisfy the birds' appetites without having any left in the troughs. Any surplus should be removed. Grit, shell, and green feed are not necessary during the fattening period. Milk or water may be given in hot weather, but at other times neither is necessary. When any birds are noticed that have gone off their feed or are not making satisfactory gains, they should be removed from the fattening quarters. At the end of the fattening period, the birds should be left without food for 24 hours before killing, so that the digestive system may be emptied. Water should be given at this time.

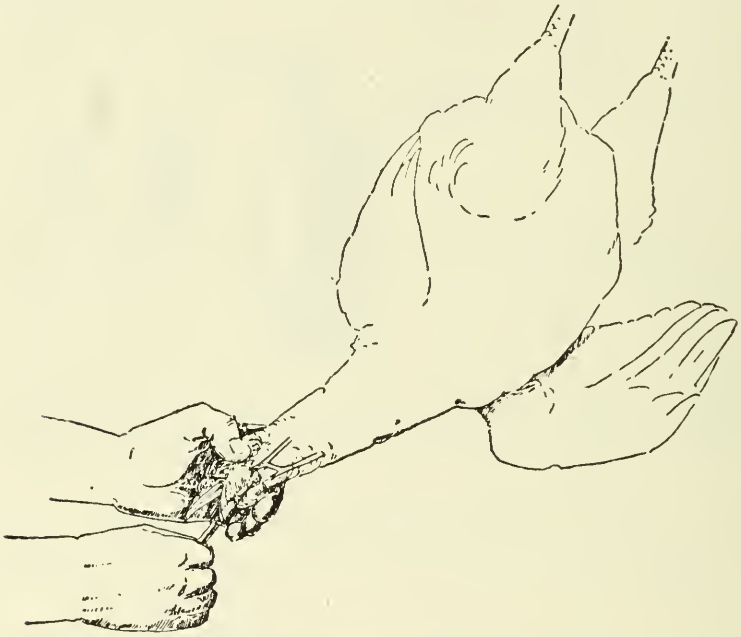
6. Killing poultry for market

Birds may be killed by beheading, by dislocation of the neck, by sticking from within the mouth and by severing the neck arteries.

(*a*) *Beheading* with an axe, hatchet, or cleaver is an easy, rapid and effective method of killing birds which are to be heavy scalded and plucked for immediate use, but has no place in the preparation of poultry for commercial sale.

(*b*) *Dislocation* or wringing the neck is a useful method of killing an ailing bird for post mortem examination, but is not used with market poultry. When using this method, the bird is held by the legs with one hand and with the head stretched forward with the other. By pulling the head forward and bending it backward at the same time, the neck bone is separated from the head. This movement also breaks the arteries of the neck and the blood accumulates in a clot where the bones have parted.

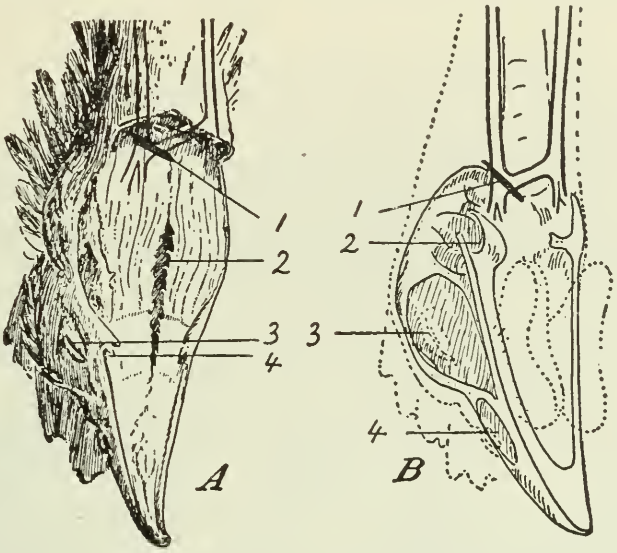
(*c*) *Sticking* through the mouth includes both bleeding and piercing the brain and has long been the accepted method of killing poultry for market. Following killing by this method, the birds are dry plucked and present a much better appearance than scalded birds. The skin is unbroken which helps maintain good keeping qualities.



METHOD OF HOLDING BIRD FOR STICKING

When killing by this method, the bird is hung in a shackle or by a cord at a height convenient for work while standing. The head is grasped in the left hand with the comb of the bird towards the palm. The mouth is forced open and the blade of the special killing knife is thrust back to its full length in the throat. A cut is then made in the roof of the mouth or throat forward and towards the right hand of the operator. If the jugular vein is properly cut, the blood will gush from the mouth in a stream. When the bird is bleeding freely, the knife is thrust into the posterior section of the brain either through the cleft in the roof of the mouth or by inserting it below the eye. Next, a weighted cup made specially for the purpose, is hooked to the lower beak to catch the blood and at the same time to restrain the movements of the bird. It is important that both cuts in the operation be made properly. If the first cut does not start rapid bleeding, a second cut should be made. Failure to bleed properly delays death and the spots where feathers were attached to the skin may remain a reddish colour. If the brain is not properly pierced, the feathers are not loosened and plucking without tearing the skin is difficult. When the brain is properly pierced, the bird gives a characteristic squawk and flutter. Practice is required to become expert at this method of killing.

(*d*) *Severing the neck arteries.* With the general adoption of slack or semi-scald plucking in processing plants, the need for loosening the feathers by piercing the brain became less important and some killing has been done by severing the neck arteries by simply cutting the throat with a sharp knife. Advocates of this method claim that better bleeding is secured than with sticking through the mouth. The birds present a less pleasing appearance, however, and it is necessary that all heads be wrapped before the birds are packed. In a modification of this method, the birds, held by a shackle and travelling along an endless chain, pass through a machine which gives each an electric shock after which the jugular veins are severed with a fast revolving circular knife. Kosher killing is also a modification of this method, done by a rabbi or his authorized assistant to meet the Jewish trade. In Kosher killing, the throat is cut with a single stroke of a long sharp-bladed knife.



WHERE THE CUTS ARE MADE IN KILLING

A

1. Correct cut for bleeding.
2. Groove or cleft in roof of mouth through which the knife blade is inserted to pierce the brain.
3. Eye.
4. Base of upper beak.

B

1. Correct cut for bleeding.
2. Angle of jaw.
3. Eye.
4. Nostril.

7. Plucking poultry

Plucking or removal of the feathers usually begins immediately after the birds have been killed. For home use and quite generally before poultry keeping reached commercial importance, birds were dipped in scalding water to loosen the feathers for easy removal. As the industry grew, dry plucking increased in popularity and became the accepted method. The method used at present in processing plants is a partial, soft, slack or semi-scald after which the birds pass to a mechanical plucking machine. Turkeys are treated similarly, but it is still customary to full-scald geese and ducks. Following rough plucking, either by hand or machine, wax has been used by some for the removal of pinfeathers and hair from the carcasses.

(*a*) *Scald plucking* can be used on birds intended for immediate consumption but it is not a satisfactory method where they are to be placed in cold storage or otherwise held for any length of time. Each bird is dipped in water at a temperature just below the boiling point (about 190 degrees F.) for a few seconds. When the feathers on the breast and the flight feathers of the wing can be removed easily, the bird is taken from the water and the feathers stripped off immediately. The chief objection to scalding is the tendency to partially cook the skin which gives it a patchy appearance and injures the keeping quality of the bird.

(*b*) *Dry plucking* is the method usually followed when poultry is killed on the farm by sticking and debraining. Piercing the brain causes relaxation of muscles and a temporary loosening of the feathers. If plucking begins immediately after sticking and is done quickly, the feathers can be removed before they become "set". Greater speed will be attained if the plucking is done in a systematic manner although all experts do not follow the same order of feather removal. Those which are most difficult to remove and where there is the greatest danger of tearing the skin should be removed first. A satisfactory order of removal might be: breast, neck, wings, tail, back, legs and fluff. One will soon learn with practice how to remove the feathers in handfuls rather than a few at a time and also how great a pull on the feathers is possible without tearing the skin. The tail feathers are removed by a twisting pull and the flight feathers of the wings are jerked out with one hand while the wings are being held next the bird's body with the other. After rough picking by this method, the pin feathers are removed as a separate operation. The carcasses are then placed in a cool room until all body heat is removed.

THE RESULT OF SCALDING

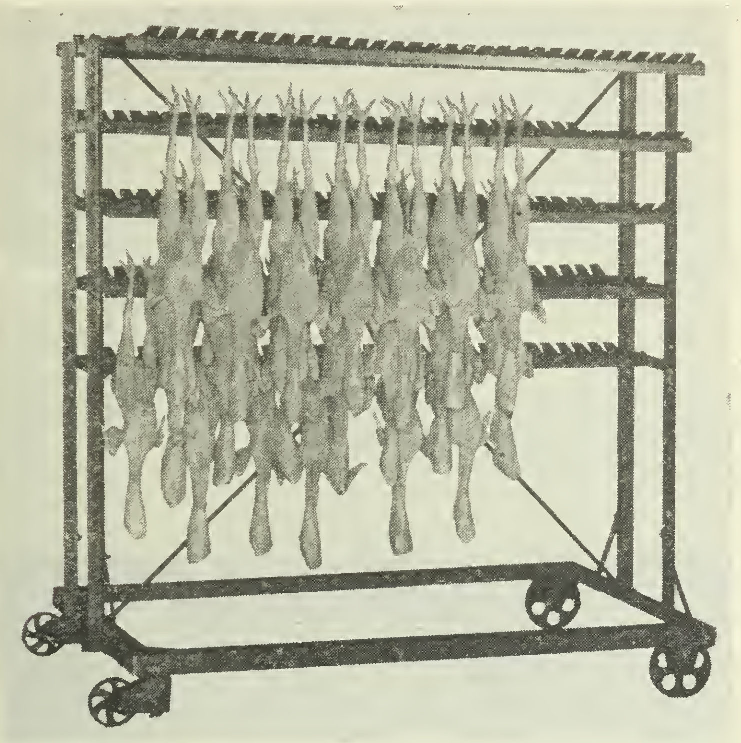
Note the patchy condition of the skin. Excessive rubbing with mechanical pluckers will produce similar results.

(*c*) *Semi-scald plucking.* With this method the birds are immersed for about 30 seconds in water at a temperature of 128 to 130 degrees F. This loosens the feathers but leaves the skin with much the same appearance as dry plucking. In processing plants the birds are automatically passed through the scalding tank in which the temperature is thermostatically controlled. From the scalding tank the birds pass to the mechanical plucker which consists of one or two revolving drums fitted with rubber fingers which quickly remove the feathers.

(*d*) *Wax plucking.* Wax is sometimes used after rough plucking to remove the remaining feathers, pin feathers, hair and loose scales of skin. With conditions right, it leaves the carcass with a very attractive appearance. Birds that are to be wax plucked must be cooled long enough to remove the body heat after which they are dipped in melted wax until a heavy coat is formed over the entire carcass. After cooling, the wax is stripped off in sheets bringing with it the feathers, down and hair which remained after the rough plucking. The wax can be used repeatedly with little loss of material if melted and strained after each time of use. Wax dipping machines are manufactured for use in commercial plants and local tinsmiths can make outfits for farm use. The use of wax is not practical where only a few birds are being killed at once and it is less used in processing plants since modern plucking machinery became common.

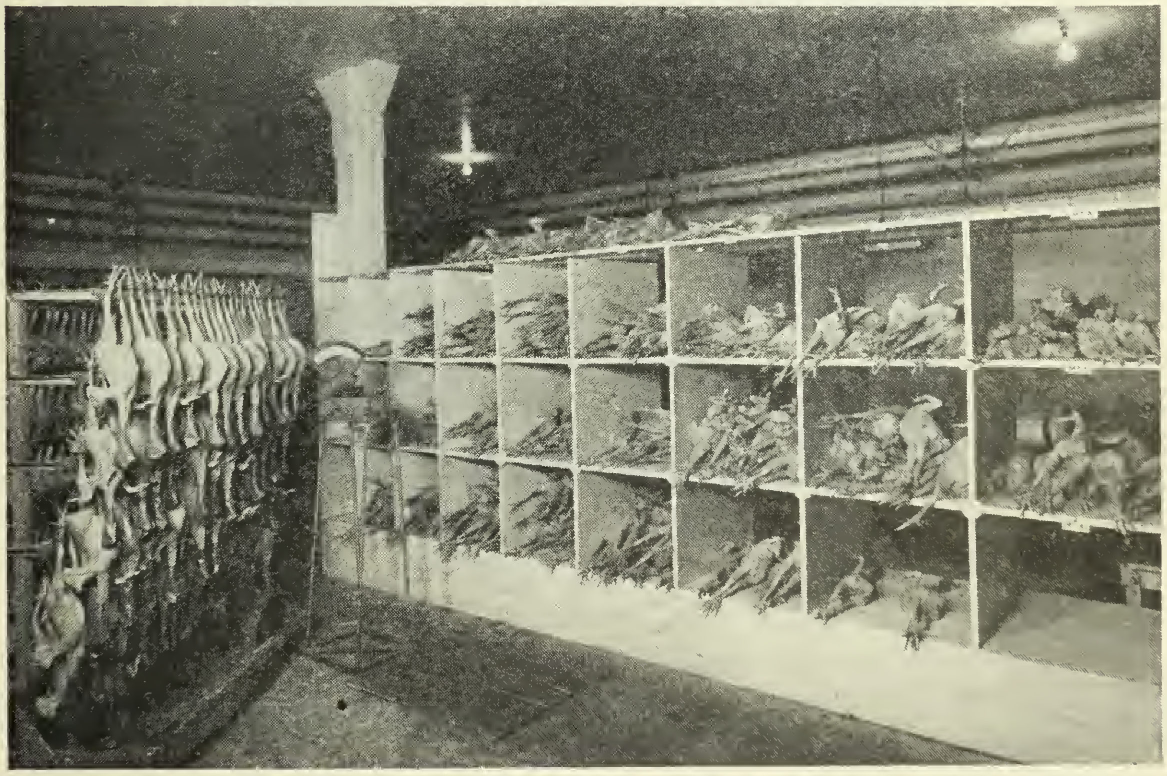
8. Cooling

After rough plucking and where wax is not used, pinfeathers should be removed and where possible the carcasses should be singed to remove hairs. The feet should be washed, vents flushed and any clotted blood removed from the mouth or throat. Under farm conditions, cooling may be done by hanging the birds in a cool cellar over night or by putting them in a tub of ice water for three or four hours. Soaking in water lessens the keeping quality of the birds but improves their appearance and is not objectionable if they are for immediate use. In processing plants the washing is done as the birds pass along the endless chain after being plucked and pinned. It is also possible to singe them with a gas torch at this time. In such plants, cooling is done in a room provided with artificial refrigeration to which the birds may be taken on the "live rail" or endless chain on which they travel through the processes of killing, scalding, plucking, and pinning.



COOLING RACK

This type of equipment is used in processing plants. Note that the heads of the birds are wrapped with paper.

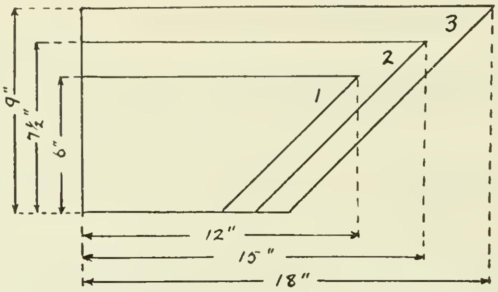


GRADING ROOM IN PROCESSING PLANT

Note the cooling rack, scale and rack for holding the different grades and weights of poultry.

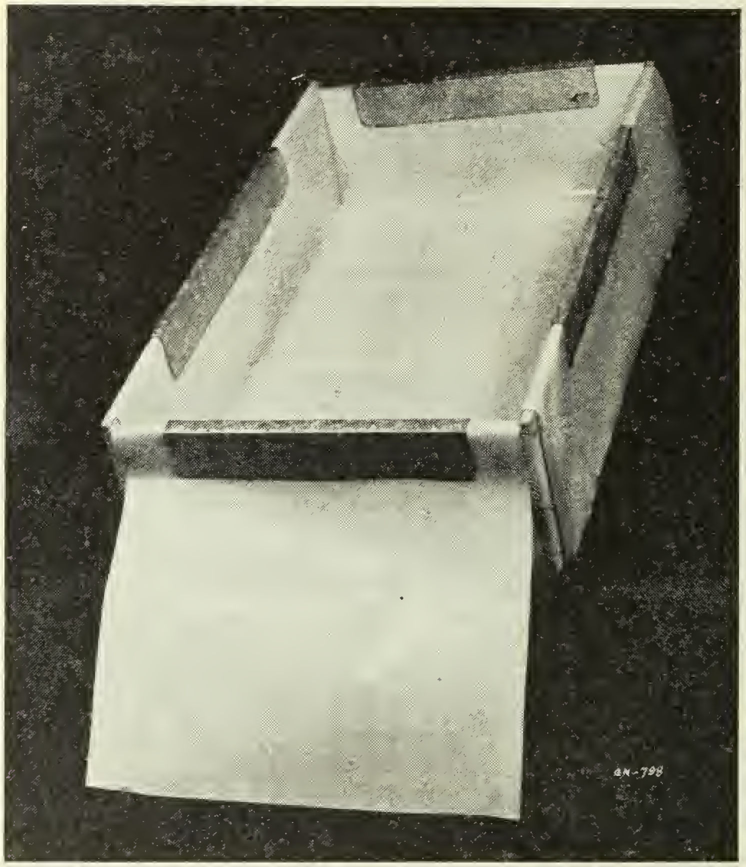
9. Evisceration

While wholesale movements of poultry have been almost entirely in the undrawn state, there are still a few sections of the country where the custom of selling drawn poultry prevails. A recent trend in retail marketing is to cut up the carcasses and offer breasts, wings, legs, backs, livers and giblets separately.



HEAD WRAPS

Prevent the dripping of blood and give dressed poultry a more pleasing appearance.
1. For broilers, small roasters and fowl.
2. For large roasters and cocks.
3. For turkeys.



BOX READY FOR PACKING

Note the white lining paper held in place with metal clips.

In drawing a bird, the neck bone is removed by slitting the skin down the back of the neck and cutting the bone off close to the body. The windpipe, gullet and crop are next removed. The long strip of neck skin remains attached to the carcass and is drawn over the incision where the neck bone was removed and held in place by the tips of the wings which are folded over it.

The intestines, gizzard, liver, heart, lungs and other organs are removed through a vertical incision in the abdomen. The oil sac, which is located near the tail, should be removed. The body cavity is washed or wiped clean and the carcass is then ready for sale or for home cooking. The contents and lining of the gizzard are removed, the gall bladder cut from the liver, any clotted blood removed from the heart and these edible organs retained for home use or sold with the neck as giblets. Small broilers are sometimes drawn by splitting the carcasses down the centre of the back with shears or a heavy, sharp knife. After being thus laid open, the internal organs, neck and breast bone are removed. Broilers dressed in this manner and wrapped in cellophane present a very attractive appearance.

Commercial eviscerating equipment makes possible the rapid drawing of poultry on a large scale and under the most sanitary conditions. It seems evident that the sale of eviscerated and cut-up poultry will increase.

10. Packing poultry

After poultry has been thoroughly cooled it is graded as to kind, quality and carcass weight and packed in paper-lined wooden boxes each holding one dozen birds. The covers are nailed on the boxes and particulars regarding contents neatly stencilled on the ends. The poultry is then ready to be frozen for storage or placed in trade channels for use. The "Regulations Respecting the Grading and Marking of Dressed Poultry" formulated and issued by the Dominion Department of Agriculture contain full particulars about grading, packing and stencilling of poultry for market.

LESSON 17

RAISING TURKEYS

Topics for Study

1. Varieties of turkeys.
2. Buildings.
3. Range.
4. How to get started in turkey raising.
5. Incubating turkey eggs.
6. Brooding poults.
7. Feeding.
8. Rearing.
9. Finishing.
10. Killing and plucking.
11. Grading and packing.
12. Selecting breeding stock.
13. Management of breeding stock.
14. Matings.

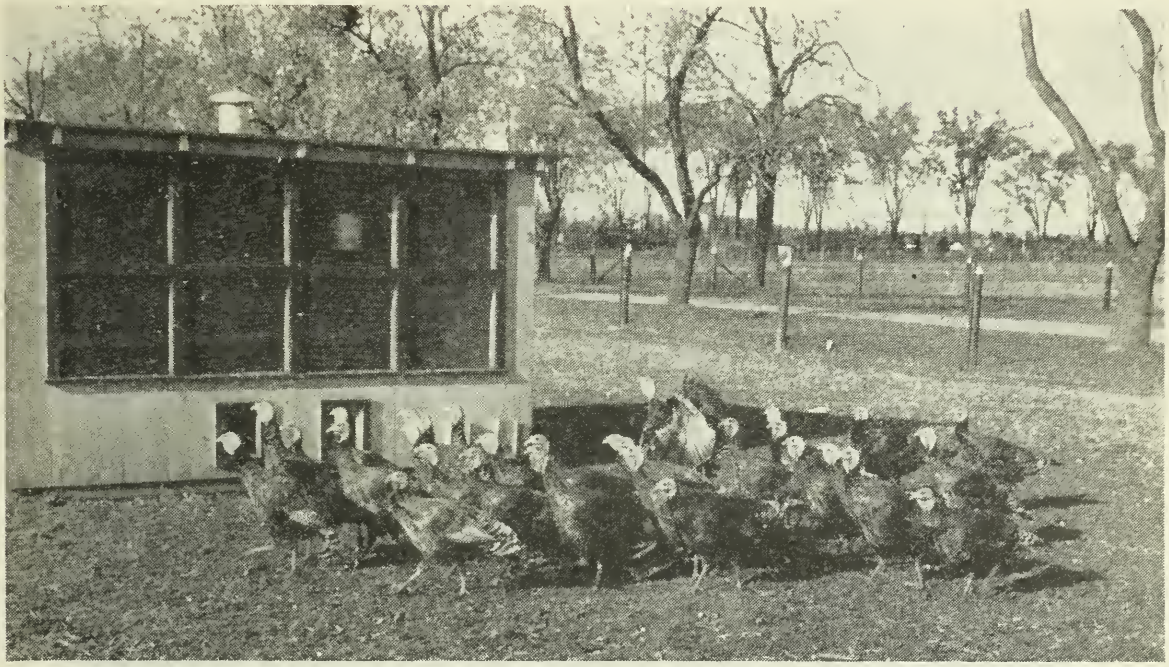
The turkey is one of the few domesticated birds of American origin. Five species of wild turkeys formerly ranged over the greater part of Mexico, southern and eastern United States and the southern part of Ontario. It is believed that the North American Indians were raising turkeys in domestication when Columbus discovered America in 1492. Explorers returning to Spain took turkeys with them and, in a comparatively short time, their progeny spread throughout Europe. It is likely that English speaking settlers brought turkeys to America that had descended from those taken to Spain and that the crossing of these with native species resulted in the development of the varieties of turkeys that are in existence today.

1. Varieties of turkeys

The *American Standard of Perfection* describes six varieties of turkeys which all belong to one breed. They are Bronze, White Holland, Bourbon Red, Narragansett, Black and Slate. Among non-*Standard* varieties are Nittany, Small White and Royal Palm.

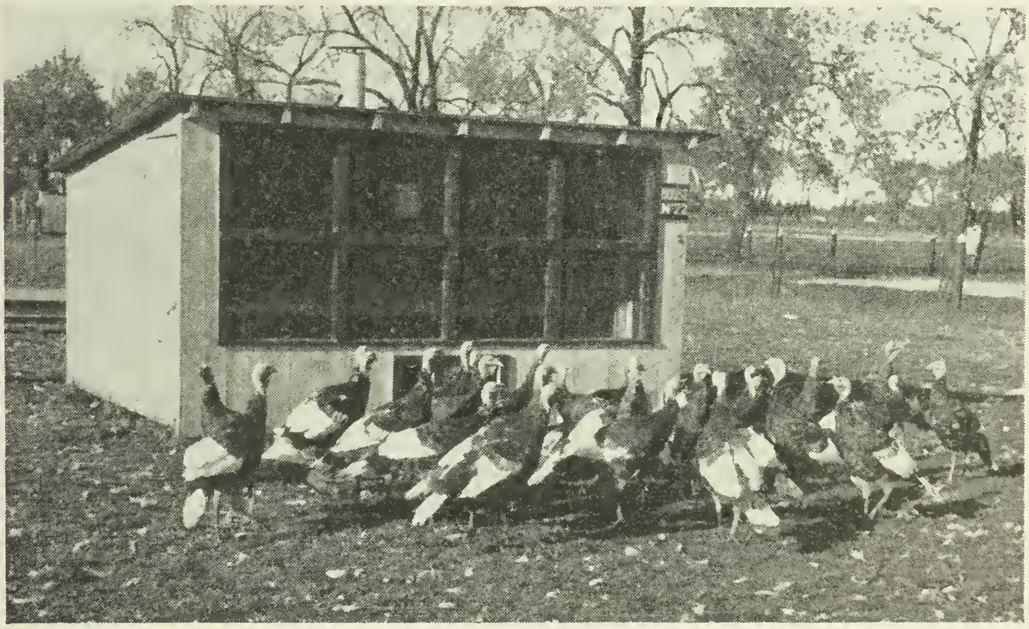
(*a*) *Bronze.*—The Bronze is the largest turkey variety and is most popular in both Canada and the United States. The *Standard* weights are 36 pounds for adult toms and 20 pounds for adult hens. The name of this variety well describes the colour which predominates in the surface plumage, viz., a rich copperish bronze. Some of the body feathers are edged with white, others are striped with black, while primary and secondary wing feathers bear parallel white and black bars of equal width. With this colour combination the birds present a very striking appearance. A selection of the Bronze variety known as the Broad-Breasted Bronze has become popular in recent years. In some cases the selection for extreme development of breast meat has so thrown the birds out of balance that they have not been very reliable breeders.

(*b*) *White Holland.*—This variety is pure white in colour with pinkish-white shanks and toes. The beard, a tassel-like growth of hair on the upper part of the breast, is black. The *Standard* weights for this and other *Standard* varieties other than Bronze are 33 pounds for adult toms and 18 pounds for adult hens.



BROAD-BREASTED BRONZE FEMALES

These birds are being reared in semi-confinement. (Photo, courtesy of Central Experimental Farm, Ottawa.)



BOURBON RED MALES

(Photo, courtesy of Central Experimental Farm, Ottawa.)

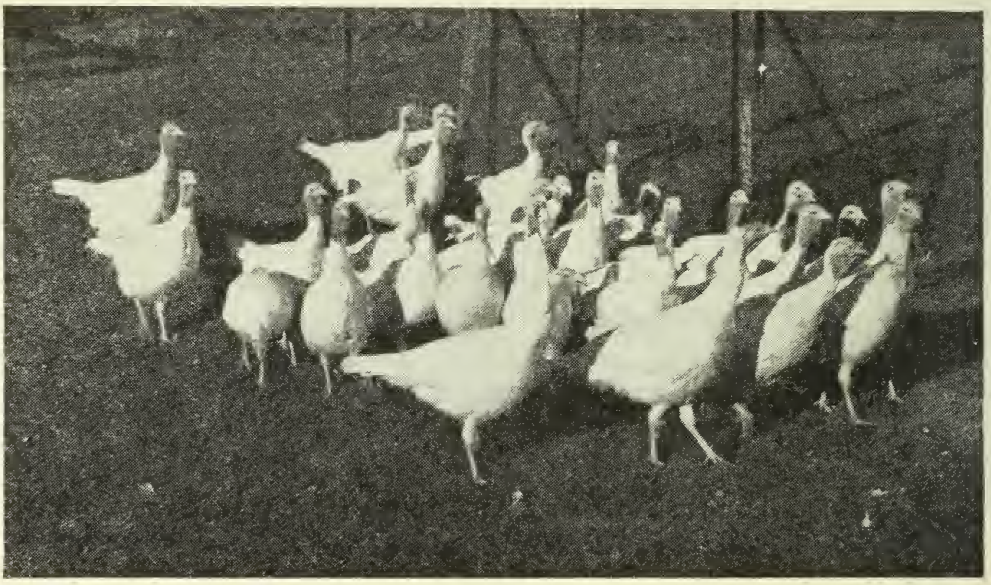
(*c*) *Bourbon Red.*—The body plumage of the Bourbon Red variety is a dark brownish-red while primary and secondary wing feathers and the main tail feathers are white.

(*d*) *Narragansett.*—The general colour pattern of this variety is somewhat like the Bronze but is more of a metallic black edged with light steel grey which makes the birds appear lighter in colour than the Bronze variety.

(*e*) *Black.*—The surface plumage of this variety is black with a greenish lustre in all sections.

(*f*) *Slate.*—The surface plumage of the Slate turkey is a clear light slate colour.

(*g*) *Nittany.*—This variety was developed from the eastern wild turkey at the Pennsylvania State College.



SMALL WHITE FEMALES

(Photo, courtesy of Central Experimental Farm, Ottawa.)

(*h*) *Small White.*—As the name implies, this variety is small in size and white in plumage colour. It was developed by the United States Department of Agriculture at the National Agricultural Research Centre at Beltsville, Maryland, with the object of producing a small sized early maturing turkey.

(*i*) *Royal Palm.*—This is a small sized variety which originated in Florida. In colour it is black and white with the latter predominating in the surface plumage.

2. Buildings

Turkeys are as easily raised as chickens but the poults require slightly different conditions of housing and management. The mature birds are specially hardy and in some sections of Canada can survive the winters without protection. It is advisable, however, to give the breeding stock some shelter and where eggs are wanted early in the season the hens must be made comfortable. There is no recognized standard type of house for turkeys. A colony house or unused barn space will meet the requirements where only a few are kept. About ten square feet of floor space should be allowed for each bird.

A turkey house needs little interior equipment. There should be roosts which allow one foot of space for each bird, one nest for each five hens, a non-wasting dry mash feeder and containers for milk and water. The nests should be shallow, should be about 24 by 24 inches in size and should have a front entrance. Barrels laid on their sides make very satisfactory nests.

An ordinary brooder house is satisfactory for brooding poults. From three-quarters to one square foot of floor space should be allowed for each poult for the first three weeks and double this amount for the remainder of the period that heat is needed. The additional space can be provided by moving half the flock to another house or allowing the poults access to a sun porch equal in size to the brooder house. Three or four times the original floor space is necessary where the turkeys are to be raised to market age in confinement.

Sun porches attached to brooder houses are more generally used for poults than for chicks. The sun porch area should be equal to the area of the brooder house floor during the period when heat is needed and at least twice as great when the birds are fully grown in confinement. The sun porch floor should be from 1½ to 3 feet above the ground and may be of such materials as 1- by 1-inch, 1- by 2-inch or 1- by 4-inch mesh wire fabric, 1- or 1½-inch mesh fox wire or 1- by 1-inch or 1- by 2-inch slats placed one inch apart.

After the brooding period, turkeys are often allowed to roost in the open but it is advisable to provide shelters that will protect them from storms and animal enemies. Such shelters are usually somewhat like the laying shelters described in Lesson 4 but may vary in actual size. Round poles or 2- by 4-inch scantling with the edges rounded off make satisfactory roosts. They should be firmly supported because of the great weight they carry as the birds approach maturity.

3. Range

The number of turkeys which can be raised successfully on one acre of range will depend on the method of rearing and the growth of green feed. If the houses or shelters are permanently located on the range and the birds allowed to run over the entire area throughout the season, no more than 50 should be raised to each acre. If, on the other hand, provision is made to divide the land and use the fields in rotation, this number can be doubled. These figures apply to where there is an abundant growth of green food and should be reduced when the growth is scanty. Regardless of the plan followed, the location of feed and water containers should be changed at least once a week for sanitary reasons. Chickens and poults should never be placed on the same range and it is not advisable to attempt raising them on the same farm. The cæcal worms of chickens are intermediate hosts of the protozoon which causes blackhead in turkeys.

4. How to get started in turkey raising

One may get started in turkey raising by the purchase of hatching eggs, day-old poults, or mature breeding stock. Any one of these plans is satisfactory. The supply of eggs and poults is seldom equal to the demand and orders should be placed early. Mature breeding stock is likely to be more plentiful and some provinces have turkey approval policies under which specially selected and banded birds can be purchased. A purchaser under any one of the plans mentioned should seek information about the type of turkeys and freedom from blackhead and pullorum disease in the flocks he considers buying from.

5. Incubating turkey eggs

The care of turkey eggs prior to incubation is identical with that recommended for chicken eggs. They may be hatched naturally by turkey hens or artificially in incubators. A turkey hen will cover from 15 to 20 eggs. The management of sitters is the same as described in Lesson 5. The incubation period is 28 days and testing is done on the tenth and twentieth days.

The principles of artificial incubation are fundamentally the same as for chicken eggs, although moisture and temperature requirements are somewhat different. For this reason it is not advisable to hatch turkey and chicken eggs in the same incubator. There are incubators specially manufactured for hatching turkey eggs but ordinary incubators can be used and will hold about two-thirds the rated capacity of chicken eggs. The manufacturer's directions for hatching turkey eggs should be followed closely. A few hatcheries specialize in the production of poults.

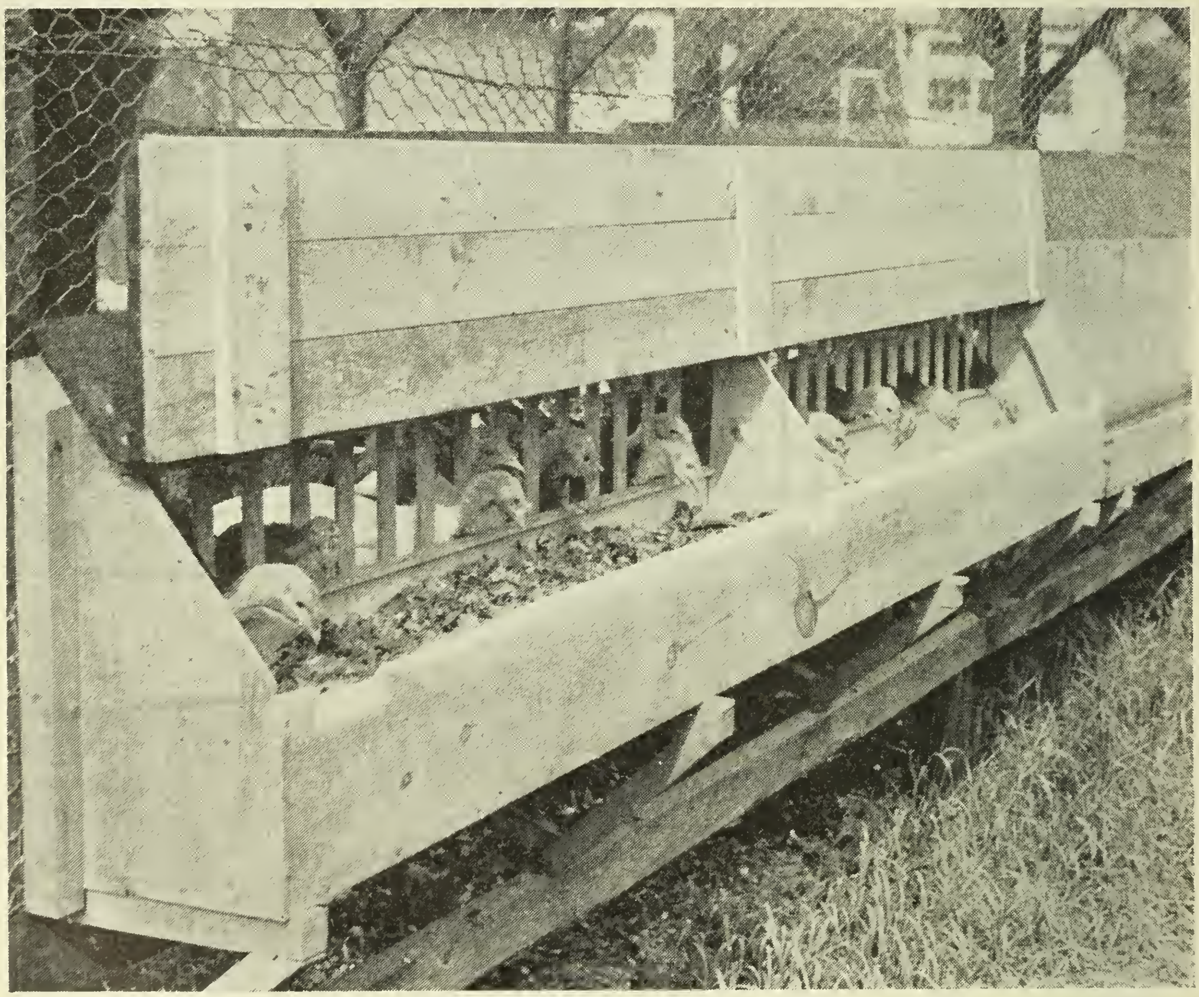
In buying or hatching poults it is well to remember that it will take from 24 to 28 weeks to grow and finish them for market. The hatching date should be such that the birds will be ready for market at the date it is intended to sell them.

6. Brooding poults

The brooding of poults by either the natural or artificial method is not noticeably different from the brooding of chicks. Poults are more easily frightened, more inclined to crowd and more easily chilled than chicks but do not require a higher temperature. They can be brooded with turkey hens or with any ordinary type of brooder. When turkeys are used, it is customary to provide the mother with an A-shaped coop having a floor space about 3 by 4 feet in size. Since turkeys are brooded somewhat later in the season than chicks, brooders which give a maximum amount of heat are not necessary and oil-burning and electric brooders are popular.

7. Feeding

Poults do not learn to eat so readily as chicks and if they go much longer than 24 hours without eating it is difficult to get them started. For this and other reasons it is desirable when buying poults to get them from a hatchery nearby rather than from a distance.



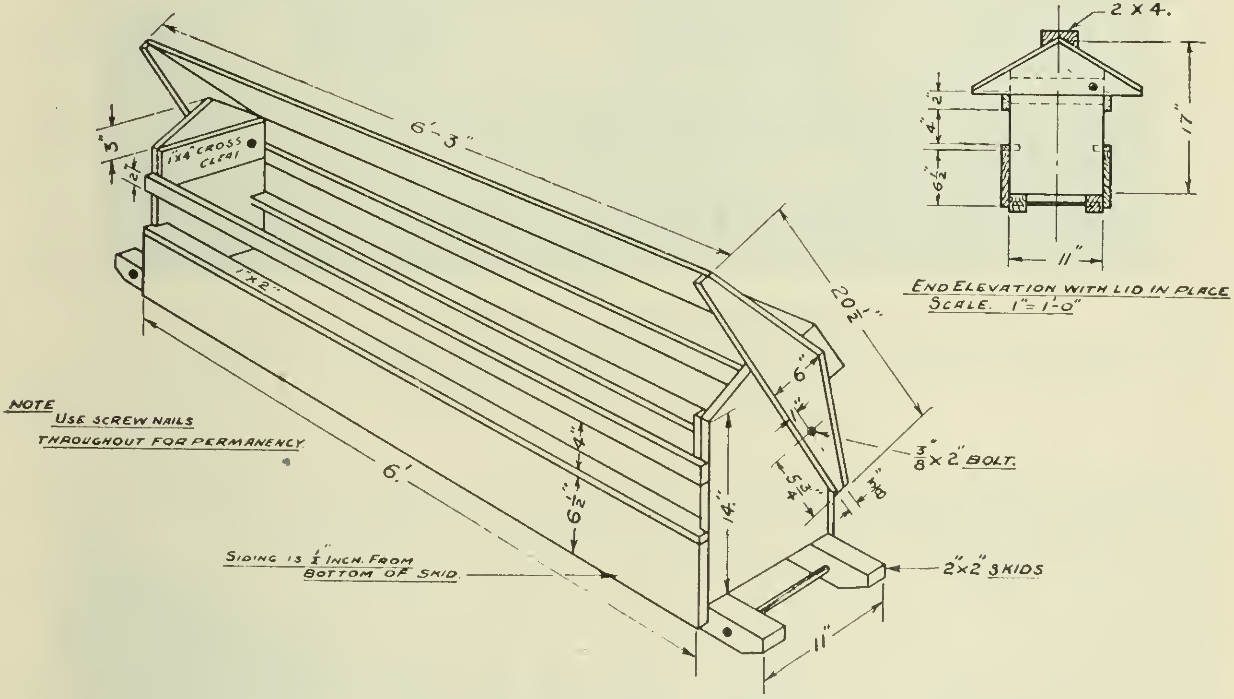
TURKEY FEEDER

This type of feeder is used for confinement rearing. It is attached to the wire-floored sun porch. (Photo, courtesy of Dominion Experimental Station, Fredericton, N.B.)

The general feeding plan for poults is the same as for chicks, although nutrient requirements differ in some particulars. Satisfactory diets for turkeys can be mixed at home when proper supplements are available but, usually, it is safer to rely on commercially mixed feeds for the starting period at least.

A turkey "starter" is used for about the first six weeks after which a gradual change is made to a turkey "grower" or "developer". The protein content of the turkey starter should be at least 24 or 25 per cent and vitamin requirements are also somewhat higher than in the corresponding mixtures for chicks.

Grains, such as wheat, oats, and corn are introduced when the poults are about six weeks old and from that time onward are kept continuously before them. There is always danger of cannibalism starting among turkeys that are raised in confinement and whole oats seem to have a value in preventing this. Green feed will be used up to 25 per cent of the diet if supplied in a succulent and palatable form. Short lawn grass clippings, cut clover, swiss chard, and rape are excellent forms of green food while long tough grass should be avoided because of the danger of its causing impaction of the digestive system.



TURKEY RANGE FEEDER

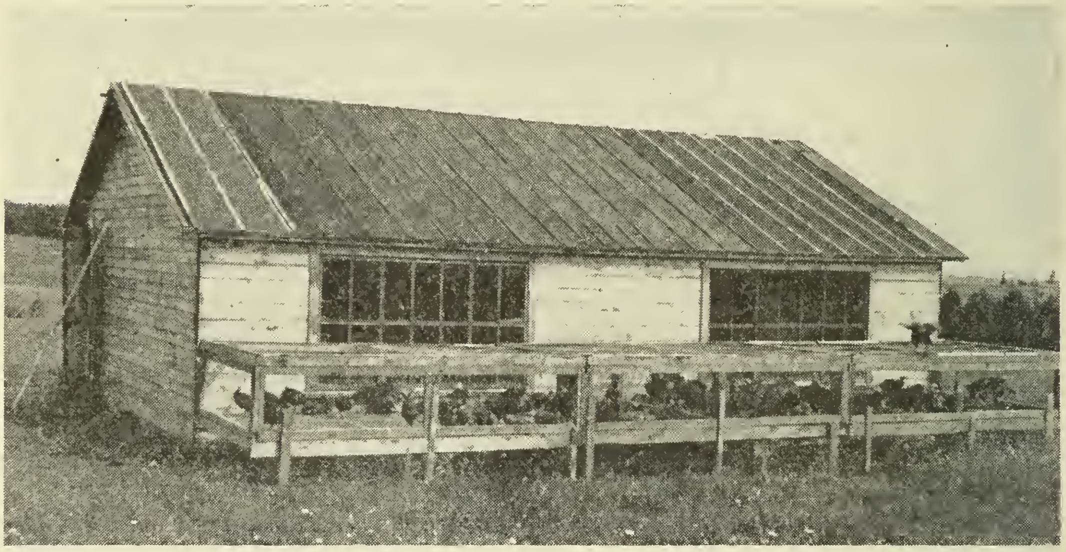
(Drawing, courtesy of Dominion Experimental Station, Swift Current, Sask.)

8. Rearing

One of the three common methods of rearing poults, viz., free range, restricted range, and confinement is usually followed after the brooding season is over.

(*a*) *Free range.*—When raised by this method, the turkeys are allowed to roam where they choose. They will pick up a considerable part of their living but there is a great danger of their picking up disease organisms while doing it. They are also subject to losses from animal enemies. Since they do not get as well-balanced a diet as with other methods of rearing, they do not mature so quickly and it is probable that the increased exercise they get also contributes towards slower growth. Because labour costs are high and hazards great, this method is not recommended.

(*b*) *Restricted range.*—Some variations in detail are possible when the poults are raised on restricted range. By one plan the poults are kept in a brooder house with sun porch attached until they are from 10 to 12 weeks of age when they are placed on a fenced range of limited size. The turkeys are moved to a new area every week and the pasture area is thus rotated to avoid contamination. By a second plan, the poults are placed in an ordinary brooder house, without sun porch, that is located on the range. The poults are kept enclosed until about two weeks old after which they are allowed out of doors in a very small yard. After another two-week period they are given the freedom of their entire range area. By semi-confinement rearing it is possible to raise from 50 to 100 turkeys to maturity on one acre of ground.



TWO-PEN BROODER HOUSE

The poults are given free range after being kept in this house and sun porch until about 10 weeks of age.

CONFINEMENT REARING

Each colony house has a large sun porch attached. (Photo, courtesy of Central Experimental Farm, Ottawa. National Film Board photograph.)

With this method of rearing, the range should have a good sod of alfalfa, clover or grass and a rotation followed so that the land is not used for turkeys more often than every fourth year. The person who cares for the poults should keep away from mature turkeys, hens, and chickens in an effort to avoid blackhead infection.

(c) *Confinement rearing.*—By the confinement method of rearing, turkeys are grown to maturity in a brooder house or shelter with sun porch attached. Both shelter and porch should have wire or slatted floors and about 10 square feet of space should be allowed for each turkey. The floor should be from 1½ to 3 feet above the ground so that the droppings on passing through will dry out quickly. When grown in this manner, turkeys lack the smooth feathering which they develop when on range but they make satisfactory gains in weight. There is usually more trouble from feather picking, leg disorders, and deformed breasts among turkeys raised in confinement.

9. Finishing

Turkeys will not fatten readily until they are approximately six months old and have undergone their final moult. Finishing is, therefore, largely a matter of maturity. The proportion of grain to mash eaten by the birds increases naturally as the birds approach maturity and, because this increases the intake of fattening nutrients, little special attention need be paid to the finishing of birds which have been raised in confinement or semi-confinement. A month of special diet may be necessary for the proper finishing of turkeys which have been raised on free range but crate and pen finishing, which are practised with chickens, are not practical with turkeys.

The carcasses of poorly finished turkeys are somewhat bluish in colour and so unattractive that there is no demand for them. A turkey is a luxury product and people who can afford luxuries are not interested in poor quality. It pays to properly finish turkeys before they are marketed.

10. Killing and plucking

Turkeys are usually killed by sticking in the manner described in Lesson 16. The birds are suspended by the feet by means of a shackle or rope and block of wood, the jugular veins are cut and the brain is pierced.

The turkeys can be dry plucked or plucking can follow full or semi-scalding. Dry plucking will produce the most attractive carcass and, since turkeys carry very little down, plucking is a comparatively easy task. The use of mechanical plucking machines is becoming quite common. They should be used with care to prevent rubbing of the skin.

11. Grading and packing

Turkeys, like chickens, are graded and packed under Dominion Department of Agriculture "Regulations Respecting the Grading and Marking of Dressed Poultry".

12. Selecting breeding stock

The practice of buying poults from a turkey hatchery is growing and the flocks which supply these with eggs, as well as all other mated flocks, should be carefully selected.

Since meat production is the chief consideration in growing turkeys, it is advisable to select breeders that possess good meat type. Long-legged, slow developing birds should never be given a place in the breeding pens. In some cases selection for heavily meated breasts has been carried so far that the birds lack balance and, as a result, are poor breeders. This extreme should, naturally, be avoided. Selection of the breeding stock should begin when the turkeys are about three months old and the final selection should be made when they reach maturity.

Early maturity is important in both males and females. Both should be vigorous and have good width of back, good depth of body and full, well-fleshed and well-rounded breasts. Plump thighs are an indication that the birds carry a good amount of meat. The keel bone should be long and straight. The legs should be relatively short, strong, and set well apart. *Standard* qualities should not be overlooked, but extremely large size in the males is not favoured because such birds are likely to injure the females when mating.

STRUTTING BRONZE MALE

Young toms are less likely to injure the females, are more active and usually their use results in better fertility. Yearling hens will, as a rule, lay more eggs than older birds and, if they are early hatched and well matured, make desirable breeders although their eggs are somewhat smaller. Breeding stock, at least males and preferably also females, should be of strains improved for egg production, fertility, hatchability, rate of growth, livability and body conformation. All these characters have a hereditary basis and are improved through trapnesting, pedigreeing, family and progeny testing.

13. Management of breeding stock

It takes considerable feed but not a great amount of care to keep a flock of breeding turkeys through the winter. They will survive poor housing conditions but, if eggs are wanted early in the season, the birds must be made comfortable and fed a well-balanced diet. They should be allowed out of doors where they can get the benefit of sunshine but it may be advisable to confine them to yards.

A large percentage of the diet during the early part of the winter can be grain but some mash and green feed should be given also. A special "turkey breeder mash" should be provided, beginning at least a month in advance of the time that eggs are desired. As with chicken hens, protein and vitamin requirements are more exacting at this time and must be supplied in order that hatchable eggs will be produced. As is the case with hens, the egg production of turkeys can be advanced and stimulated by the use of electric lights. With the approach of egg production, nests should be provided with clean, dry nesting material.

14. Matings

Usual matings are one yearling tom to 12 to 15 hens and one two-year-old tom to 10 to 12 hens. It is not economically sound to retain old toms as breeders and it is only where males have specially good records of fertility, hatchability, and good progeny that they should be kept for a second year's matings. Toms are inclined to fight and where more than two must be kept, the matings should be separated so that they cannot see each other. If separated only with a wire fence, they may spend their time trying to fight through the wire and fail to eat enough to keep themselves in good condition to mate with the hens. Where only two toms are kept, the hens can all run together and the toms may be allowed to run with the flock on alternate days.

The backs of females are often quite badly torn with the toe nails of the toms during mating. This damage can be eliminated by protecting the backs of the hens with canvas saddles made specially for this purpose.

LESSON 18

POULTRY HEALTH

Topics for Study

1. The poultry health problem.
2. How to maintain health.
3. Cleaning the poultry house.
4. Animal parasites.
5. Specific diseases.
6. Non-specific diseases.
7. A poultry tonic.

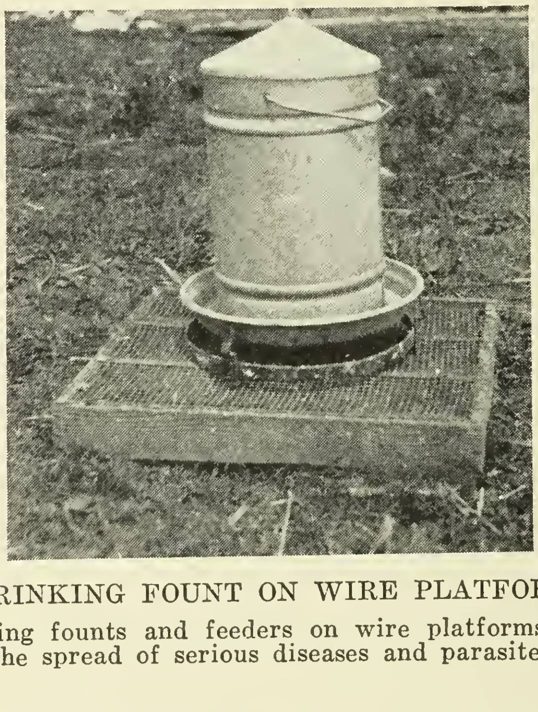
1. The poultry health problem

Since the beginning of the present century the poultry industry has undergone great changes. Poultry is kept in much larger flocks than formerly with the result that the danger of disease infection has increased greatly.

In order to safeguard the individual flock and the poultry industry in general, laboratories have been established at convenient points throughout Canada where information can be obtained regarding the various diseases affecting fowl. Literature is also available at these centres which summarizes knowledge regarding modern methods of control.

2. How to maintain health

To maintain a healthy flock, it is necessary to have vigorous stock, to keep the birds in a suitable environment, to feed them properly and to take such steps as are necessary to control or get rid of transmissible diseases.



DRINKING FOUNT ON WIRE PLATFORM

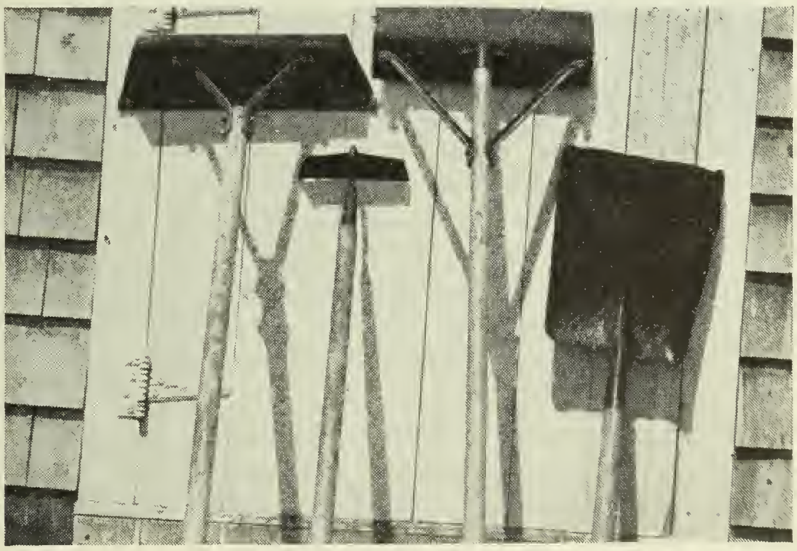
The placing of drinking founts and feeders on wire platforms will help to prevent the spread of serious diseases and parasites.

(*a*) *Vigour.*—One of the best indications of vigour in hens is the ability to live and reproduce for periods of two, three, or more years. Hens in farm flocks are seldom profitable for periods of this length but long-lived birds are especially valuable to breeders of pedigreed poultry, particularly when found in family groups, and make ideal foundation stock. High egg production alone is not necessarily an indication of great vigour.

(*b*) *Environment.*—The importance of suitable surroundings for the flock should not be overlooked. The housing conditions must be such as will keep the birds comfortable at all seasons and this requires that there shall be proper shelter, light, ventilation, and sanitation. Sanitation plays a vital part in providing a suitable environment. Clean incubators and brooders, clean houses and yards, clean litter, clean feed and water in clean containers and placed on wire platforms, the rotation of fields for range, avoidance of overcrowding, the keeping apart of growing and laying stock, the temporary quarantine of all birds brought on the plant, the exclusion of visitors from the poultry quarters, the immediate removal of sick birds from the flock and the disposal of dead ones are all necessary steps in a program of sanitation. It should not be presumed that a visible sanitation is sufficient, because carriers of such diseases as pullorum and tuberculosis may exist among the fowls kept in the cleanest of houses. It is clearly unwise to raise pullets under ideal conditions of sanitation and later to house them in the same buildings with infected stock. Infected mature stock should be entirely disposed of and complete replacement made from a disease-free source.

(*c*) *Proper feeding.*—Emphasis has been laid on the need of a properly balanced ration in Lesson 8. Feed has a direct bearing on the health of the flock. Where mineral elements or vitamins are lacking, the constitutions of the birds may be weakened to the point that definite diseases result.

(*d*) *The control of transmissible diseases.*—The control or, better yet, the complete eradication of pullorum disease by slaughtering the reactors or carriers which can be detected by blood testing, is now looked upon as an important step in the maintenance of a healthy flock. This is an example of a control measure that has become routine and indicates to some extent the measures adopted for stamping out extremely infectious diseases.



CLEANING EQUIPMENT

Left to right: dropping board scraper, hoe. floor scraper and shovel.

3. Cleaning the poultry house

Poultry buildings should always be kept reasonably clean and at least once yearly the cleaning job should be exceptionally thorough. With brooder houses, this special cleaning should be just before chicks arrive in the spring and with laying houses it should be just before the pullets are housed in the fall. Droppings, litter and other material should be removed with shovel, scraper, and broom. Walls, floors, and fixtures should then be scrubbed thoroughly with a hot lye solution made by adding one tablespoonful of lye to 20 gallons of water. Such washing should be followed by the application of a reliable disinfectant such as lye in 2 or 3 per cent solution, or one of the many disinfectants derived from coal tar and sold under various trade names. Chlorinated lime is both a disinfectant and deodorant and can be used in the proportion of six ounces to each gallon of water.

4. Animal parasites

Fowls are subject to infestation from many kinds of animal parasites. Those which live outside the bodies of the birds are called external parasites and those which live within the body, internal parasites.

(*a*) *External parasites.*—The most troublesome external parasites of poultry are lice, roost mites, northern fowl mites, and scaly leg mites. Both chickens and hens may become infested, with the result that development or egg production may be seriously affected.

Lice

Many species of lice are found on domestic fowls, the most prevalent being the common body louse which frequents the region about the vent of hens, and the head louse which is found on the heads of young chickens and turkeys. Lice spend their lives on the bodies of the birds and cause constant irritation. Several effective methods of treatment are known for the control of body lice. Dusting with sodium fluoride from a perforated-top tin or applying the same material to the skin, in pinches with thumb and finger, on 8 or 10 parts of the body are effective. Dipping the birds in a solution of one ounce of sodium fluoride to one gallon of water is a satisfactory treatment which can only be used in warm weather. Sodium fluoride is cheap and one pound will treat about 100 birds. Nicotine sulphate has proved very effective and does not require that the birds be handled individually. It is applied to the roosts just before roosting time at the rate of about 8 ounces to 100 feet of roosting space. The fumes from the material, released by the body heat of the hens, are deadly to lice. Some ventilation should be given to avoid injury to the birds but best results cannot be secured in a draughty house. Treatment with either sodium fluoride or nicotine sulphate should be repeated in about 10 days' time. Spraying the birds after they have gone to roost with water suspensions or emulsions containing 2 to 5 per cent DDT is also recommended. About 1 fluid ounce per bird applied with a portable pressure spray has been found satisfactory. Head lice can be controlled by the application of a small amount of melted lard, vaseline or other mild grease to the top of the head of each chick or poult.

Common Red Mites or Roost Mites

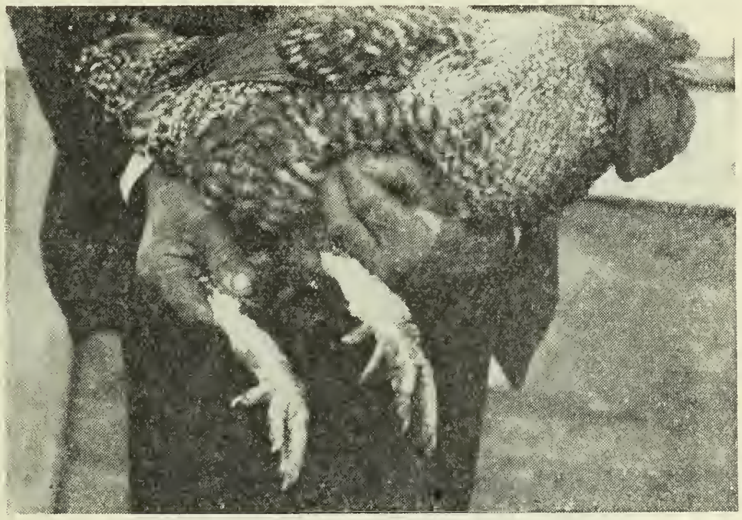
Mites are tiny creatures related to spiders. The common species is red only when gorged with blood. They live in the crevices of the building, particularly around the roosting quarters and suck blood from the bodies of the birds during the night. Treatment must be applied to the roosts and their supports. Wood preservatives, or closely related products sold under different trade names, are very efficient as sprays because they possess both penetrating and lasting qualities. Nicotine sulphate and coal tar dips in 10 per cent solution are quite effective. A cheap and fairly efficient remedy, if applied weekly, is spent crank case oil diluted with kerosene. Repeated treatments are necessary with all materials because of the difficulty in reaching all cracks and crevices and the speed with which these pests multiply in hot weather.

Northern Fowl Mites

This pest, which resembles the common red mite in appearance, lives on the bodies of the birds. Injury to the birds is caused by the sucking of blood which may occur in patches to the extent that scab formation follows. This naturally ruins the appearance of the birds when dressed for market. The nicotine sulphate treatment, recommended for the control of body lice, will be found helpful in the control of this parasite. At least three treatments at three-day intervals are necessary for effective control.

Scaly Leg Mite

These tiny mites burrow under the scales of the legs where they set up an irritation. This produces secretions which accumulate under the scales, harden and push the scales outward until the legs appear much enlarged. Eventually the scales may drop off and lameness is found in some cases. Scaly legs are rarely seen with young birds and in flocks which are kept under sanitary conditions. Any kind of oil which is penetrating enough in its nature to reach the mites will kill them. A time-honoured remedy is the dipping of the feet and shanks of affected birds in a mixture of one part kerosene and two parts raw linseed oil.



SCALY LEGS

(*b*) *Internal parasites.*—Chickens harbour a variety of internal parasites. Some of them are capable of causing severe disease in otherwise healthy flocks, others invade and cause damage when the resistance of the bird is lowered by other conditions such as malnutrition, while others appear to do little or no harm. The single-celled protozoa, mainly the coccidia, are by far the most important internal parasites. Of some importance are the thread-like capillaria worms, and under certain circumstances the cæcal worms, large roundworms and tapeworms are important.

Cæcal Coccidiosis

This form of coccidiosis is the one which causes bloody droppings in chicks three to seven or more weeks of age. It is a severe disease which appears suddenly and may cause a great mortality over the course of three or four days. It is estimated that the annual loss from this disease in Canada has exceeded 8,000,000 birds. Essentially it is a disease of chicks raised in modern sanitary brooders and it breaks out whenever a group of susceptible chicks are suddenly exposed to the microscopic oocysts which practically every grown chicken passes in its droppings. The disease does not occur when young chicks are exposed to a few parasites during early life, as immunity can be acquired quite quickly. However, as exposure of brooder-raised chicks to contaminated floors may be dangerous, even though inevitable, ways and means of applying a brake or suppressive agent on the disease have been worked out. The method to be used varies considerably between farms or plants and the poultry owner should refer to a more detailed consideration of the subject in Publication 788 (Farmers' Bulletin 141,) Dominion Department of Agriculture, "Methods of Controlling Cæcal Coccidiosis of Chicks." The methods include the use of sulphamethazine or sulphamerazine in the feed, at one ounce of drug per 15 pounds of mash for three days beginning as soon as the first signs of bloody droppings are detected. Sodium sulphamethazine may be used in the drinking water, one ounce per three Imperial gallons. On farms raising only one or two lots of chicks per year the amount of contamination on the litter may be uncertain and for this reason it is sometimes better to give the full dose for the first day, and then half the amount in feed or water for two days. This is followed by two or three days without treatment, then two more days of treatment is given, also at half the original dose level. In other words, in first outbreaks in a single flock sodium sulphamethazine, for example, is used at one ounce per 3 Imperial gallons of drinking water the first day bloody droppings are seen and then at one ounce per 6 gallons for four more days spread over the next week.

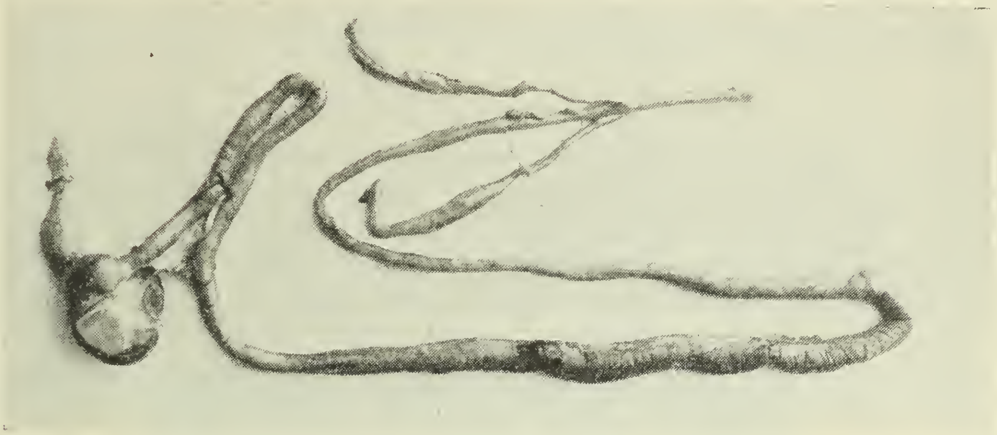
CHICK AFFECTED WITH CÆCAL COCCIDIOSIS

(Photo, courtesy of Division of Animal Pathology, Science Service, Central Experimental Farm, Ottawa.)

In larger plants where the disease breaks out severely the full treatment for three consecutive days, with a fourth day of treatment later on if necessary, is recommended as being a safer procedure.

In plants which suffer losses from cæcal coccidiosis continually in successive waves it is advisable to adopt a system of deliberately exposing susceptible chicks to litters contaminated by older, recovered, or immune chicks. This litter should not be too dirty, as very recent droppings from older chicks usually contain sufficient oocysts of coccidia to ensure infection. As soon as the younger chicks are placed on this litter they are treated with either sulphamethazine or sulphamerazine, one ounce per 40 lb. of feed, or with one of the soluble forms of these drugs, one ounce per 6 to 7½ gallons of drinking water. This is continued for 6 days, and at the end of that time the chicks usually resist harmful coccidiosis.

They should be left on the contaminated litter for the 6 days of treatment, but for not more than 10 days in all. It is sometimes better to move them or to change the litter at the end of the sixth day.



RESULT OF CHRONIC COCCIDIOSIS

Note enlargement and inflammation of upper section of intestine. (Photo, courtesy of Division of Animal Pathology, Science Service, Central Experimental Farm, Ottawa.)

Chronic Coccidiosis

Chronic or intestinal coccidiosis usually affects older birds and causes an inflammation and thickening in the upper intestines. There is no medicinal treatment but, unlike cæcal coccidiosis, it can usually be controlled by dryness and cleanliness. If any sign of a chronic diarrhoea is seen in older birds it is important to get an accurate diagnosis as soon as possible. Measures must be taken to prevent dirty, damp places developing around drinking fountains and other places. (See illustration of a sanitary drinking fount page 168.) Highly nutritious food supplements such as milk and milk powder are very useful in helping recovery.

Large Roundworms

Large roundworms (*Ascaridia galli*) are not common in Canada now, and this is probably due to greatly improved poultry diets and the hygienic production of chicks. However, chicks on diets low in vitamin A and other essential food substances, and which are exposed to droppings from adult hens, may acquire sufficient of these parasites to be harmed by them. The worms are two inches or more in length and live in the part of the intestine about six inches behind the gizzard. In severe cases the intestine is blocked by masses of worms; however, less than 25 worms do not appear to be of great importance.

The logical means of control are good sanitation and balanced rations for chicks. There are several medicines on the market, including nicotine products and tetrachlorethylene. However, poultrymen should adopt medicinal treatment only after a proper diagnosis of roundworm infection, as the drugs given when other conditions are responsible for the illness might be dangerous, in addition to being a waste of money.

Cæcal Worms

These are much smaller than the large roundworms, being about one-half inch in length and thread-like in appearance. They live in the cæca or blind pouches of the intestine. They do little damage by themselves but they are very important because they are able to carry the disease blackhead from chickens or adult turkeys to turkey poults which come in contact with the droppings containing the worm eggs. When turkey poults are to be raised on any farm it is advisable to take steps to eliminate this worm parasite. Good sanitation is, of course, necessary, but in addition the adult birds should be treated with phenothiazine once every six weeks. This drug can be used as tablets or as one ounce of powder thoroughly mixed into the mash of 100 chickens or 50 adult turkeys and given for one day only. This drug is not a cure for blackhead and should not be used as a treatment of that disease.

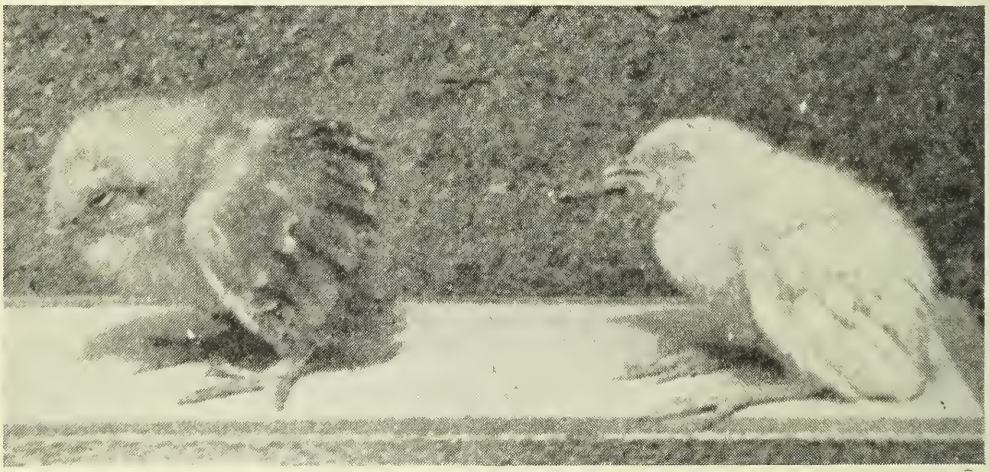
Tapeworms

These are white, ribbon-like and segmented worms, varying from almost microscopic size to several inches in length. They are quite firmly attached to the lining of the intestine and all but one species are easily seen in an opened intestine from a dead bird. They are not of any great importance in modern poultry plants, but in filthy chicken runs, where slugs, beetles and flies abound, chickens sometimes become heavily infected and then become very unthrifty. As the above-mentioned slugs and insects carry chicken tapeworms, their control by sanitation and clean range is not difficult. There is no effective medicinal treatment.

5. Specific diseases

A specific disease is one caused by a particular organism or agent such as a definite species of bacteria or type of virus.

(*a*) *Diseases caused by bacteria.*—Bacteria are single-cell organisms belonging to the plant kingdom. Many of them are beneficial to man but a few species cause disease. The common poultry diseases of bacterial origin are pullorum disease, tuberculosis, and coryza.



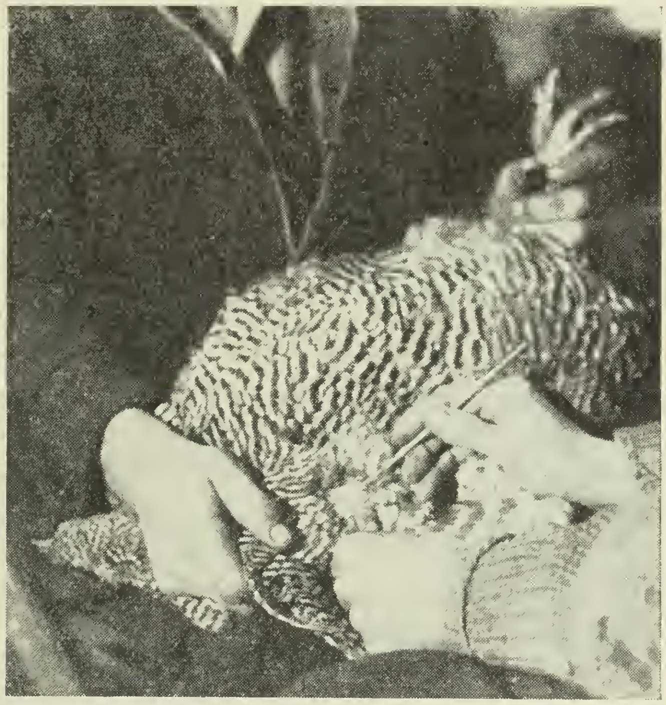
CHICKS AFFECTED WITH PULLORUM DISEASE

(Photo, courtesy of Division of Animal Pathology, Science Service, Central Experimental Farm, Ottawa.)

Pullorum Disease

Formerly known as bacillary or contagious white diarrhoea this disease is caused by specific bacterial infection. At one time it was considered the most serious cause of mortality among young chicks but control measures have greatly reduced the losses in recent years. The most serious loss from pullorum infection occurs during the first three weeks of the chick's life but it is also found among older chickens and mature birds. Among mature birds it is usually found in chronic form and it is these chronic "carriers" which transmit the disease to the succeeding generation of chicks.

This disease spreads rapidly among very young chicks and mortality may be high, particularly if the chicks are subjected to such unfavourable conditions as chilling, overheating, or other mismanagement. Some chicks die shortly after they hatch without showing marked symptoms. Others linger in a droopy, huddled, inactive condition and frequently utter shrill cries as if in pain. Diarrhoea, which causes a "pasting up" of the down below the vent, is a common symptom though not always present. Post mortem examination may show changes from the normal condition in heart, liver, and intestines but frequently such changes are not present. Mature birds which are carriers of the disease seldom show any marked symptoms. Experiments have shown that the disease spreads slowly among older birds and that egg production is affected to some extent. An examination of the internal organs frequently shows the ova or developing egg yolks to be shrunken and dark coloured rather than round and yellow.



DRAWING BLOOD SAMPLE FOR PULLORUM TESTING

The symptoms described above in young chicks, particularly when accompanied with high mortality, suggest the presence of pullorum disease. Positive proof requires a laboratory examination since almost any mismanagement of young chicks will result in similar symptoms. No effective treatment is known. The "carriers" among mature birds can be detected by means of a blood test and this offers the best method of control known. All breeding flocks should be given a yearly blood test and reactors should be promptly killed. After the reactors have been removed, the buildings should be given a thorough cleaning. When a flock having a high percentage of reactors is found, repeated testings at periods of one or two months are usually necessary to rid the flock entirely of the disease. Frequently it will be found more satisfactory and less expensive to replace such a flock, from sources free of pullorum disease, rather than to eliminate the disease by repeated testings. All eggs, chicks, and other stock purchased should be secured from flocks having as good a record as possible in freedom from pullorum infection. Pullorum control in Canada is principally under provincial supervision and local Departments of Agriculture can supply the results of their work to those interested in such information.

Tuberculosis

Tuberculosis is a bacterial disease found mostly in fowls over one year old. This disease should be suspected where occasional birds in the flock gradually become thin, show a dull and ruffled appearance in the plumage and sometimes diarrhoea and lameness. On post mortem examination, yellowish lumps or nodules are found on the liver, spleen, intestines and to a lesser extent on other organs. The disease is spread principally through the droppings. Medicinal treatment is of no value. Fortunately, the practice of keeping layers for one year only on commercial plants, reduces the occurrence of this disease and in many localities it is practically unknown.

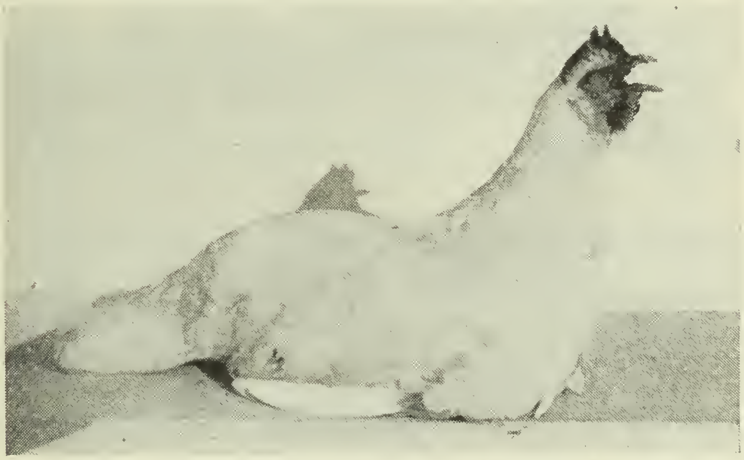
The diseases can be diagnosed by applying the tuberculin test or by a laboratory examination. Where infection is found to be present, it is good practice to dispose of the entire flock using the carcasses of those that have no evidence of disease for food purposes and destroying the remainder by burning. This eliminates the danger of diseased carcasses finding their way to hog pens and spreading the disease to these latter animals. The buildings and utensils should be thoroughly cleansed and disinfected and where possible pens should be left vacant during the summer months.

Coryza, Catarrh, Roup, Colds

These names have all been applied to inflammation of the lining of the respiratory tract which occurs very commonly in varying degrees of severity. One species of bacteria is known to cause a typical coryza but it is possible that other organisms may also cause this condition when the birds are exposed to unfavourable conditions. Birds of all ages are subject to colds. The trouble is most commonly found where there is overcrowding, poor ventilation, improper feeding, or where the birds are housed under damp, draughty, or unsanitary conditions. Very often an outbreak will follow the rather abrupt change which takes place when pullets are transferred from the range to winter quarters. The first symptom noticed is a watery discharge from the nostrils which is accompanied by sneezing and shaking of the head. The discharge soon thickens in the form of yellow crusts about the nostrils. The inflammation extends to the sinuses which become filled with mucus. This, on hardening, becomes cheesy in consistency and as it accumulates there is a bulging or swelling of the face. This cheesy material may sometimes be found in the eyes and also in the mouth and throat. There is loss of appetite and the birds become inactive with feathers ruffled. In the most severe cases, breathing is difficult and the birds lose weight rapidly. In laying flocks, egg production is usually seriously affected. Treatment is not entirely satisfactory but may reduce the suffering of the birds and assist in a quicker return to health. A dose of epsom salts (one-half pound to 100 birds) should be given when symptoms are first noticed. Instilling a 10 per cent solution of argyrol in the nostrils daily with a medicine dropper will benefit the birds and, where there is extreme bulging of the face, the distress may be relieved by opening the sinuses with a knife to permit the removal of the cheesy contents. A tonic in the mash may assist in getting the birds back to normal egg production. The avoidance of overcrowding, provision of dry and well-ventilated houses, proper sanitation, the temporary quarantine of all birds coming on the premises and a plentiful supply of well-balanced feeds will assist in preventing outbreaks of this type. The flocks should be watched closely for symptoms of colds and all birds showing symptoms should be removed immediately.

(*b*) *Diseases caused by viruses.*—The agent which causes virus diseases will pass through very fine filters but cannot be seen with the aid of a microscope as can bacteria. The most common virus diseases of poultry are laryngotracheitis, infectious bronchitis, fowl pox, epidemic tremors, transmissible leucosis, and inoculable tumours. Range paralysis, believed by some authorities to be a virus disease, is listed here although there is no definite proof that it is of virus origin.

Laryngotracheitis.—This is a highly infectious disease of the upper respiratory tract which may affect birds of any age but usually causes most serious loss among those between 6 and 12 months of age. The first symptoms noticed are a watery discharge from the eyes and an inclination to remain quiet. Later there is a rattling sound in the windpipe and coughing which results in the discharge of bloody mucus. Frequently the head is raised and the neck extended as the bird gasps for inward breath, and lowered as it breathes outward. Post mortem examination shows an inflammation of the windpipe and larynx with the former frequently filled with blood stained mucus. It is this accumulation of mucus which causes laboured breathing and in many cases, death by suffocation. A proportion of the affected birds recover and it is probable some of these remain carriers of the virus. When an outbreak occurs it is advisable to give the flock a dose of epsom salts at the rate of a pound to each 100 mature birds. The birds should be disturbed as little as possible and well fed so that their body weight will be maintained. The introduction of new birds to a poultry plant or the return of birds from an exhibition are common means of spreading this disease. Since flock or individual treatment is of little value, control by vaccination is the practical method of dealing with this disease. The vaccine is recommended only as a preventive against infectious laryngotracheitis on farms where it is known to exist or on newly established farms in an infected area: also for immunizing units of birds where certain pens are infected and there is reason to expect further spread of the disease.



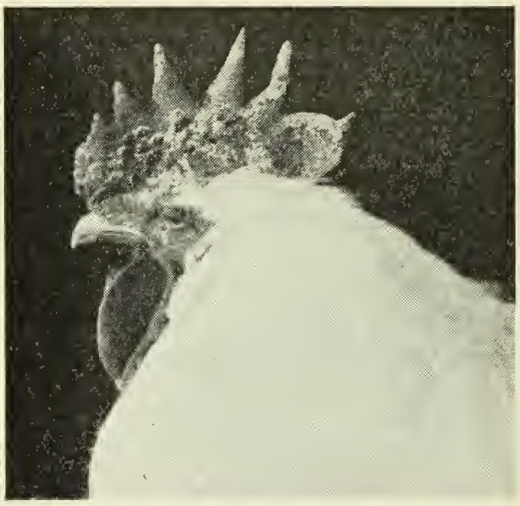
VICTIM OF LARYNGOTRACHEITIS

(Photo, courtesy of Division of Animal Pathology, Science Service, Central Experimental Farm, Ottawa.)

Infectious Bronchitis.—This disease resembles laryngotracheitis in its symptoms but is most commonly found among chicks between two days and three weeks of age. The affected chickens appear dull and listless and there is gasping for breath. Blood stained mucus in the trachea, which is a very common condition in laryngotracheitis, is absent in infectious bronchitis. Mortality may vary from 10 per cent to a large proportion of the flock. Inhalants of a soothing nature, such as eucalyptus products, may ease the distress of the chicks but cannot be considered a cure. Increased heat in the brooder house at this time may save the lives of many chicks. With this disease and laryngotracheitis, great care should be taken in the source from which chicks or other stock are purchased in order to avoid the introduction of the disease in this manner.

Fowl Pox

Two forms of this disease exist and both may appear in one outbreak. One affects the comb, wattles, and skin on the face and the other, the lining of the mouth, the tongue, and the larynx. In the skin type, small wartlike growths appear about the head and spread in size until they become large scabby masses. In the diphtheritic type, raised, yellowish patches appear on the inside of the mouth and tongue and may increase in size until they interfere with eating and drinking. The eyes may also be affected. The disease spreads rapidly through a flock by the contact between diseased and healthy individuals. The severity of outbreaks varies greatly. If mild, the health of the birds is very little affected while in severe cases the appetite is lessened and egg production is reduced. Mortality is greatest in the diphtheritic type.



FOWL POX LESIONS

(Photo, courtesy of Division of Animal Pathology, Science Service, Central Experimental Farm, Ottawa.)

Treatment has little value except where the removal of scabs from mouth and tongue may be necessary to allow the birds to eat and drink. In such cases, the raw areas should be painted with tincture of iodine. Vaccination produces immunity but the careless and indiscriminate use of fowl pox vaccine in districts where the disease is unknown may establish new centres of infection. Where fowl pox occurs regularly, vaccination is the only means of assuring freedom from this disease. To prevent its introduction any birds purchased or returning from exhibitions should be quarantined for a three-week period before being placed in the general flock. Following an outbreak, the buildings and equipment should be thoroughly cleaned and disinfected.

Epidemic Tremors

The outstanding symptom of this disease is a constant trembling of the body accompanied by a violent shaking of the head. It occurs among chicks during their first three weeks of life and mortality may be high among affected hatches. No satisfactory control measures are known.

Avian Leucosis Complex

The term "Avian Leucosis Complex", is used to designate several diseases having some features in common as regards body alterations but differing to such an extent from the standpoint of symptoms as to warrant separate descriptions. Included in this group are such diseases as transmissible leucosis, grey eye, fowl paralysis and big liver disease. Some of these conditions are characterized by changes in the number and types of cells in the blood stream usually accompanied by a severe anaemia while in other forms of leucosis the blood appears to be quite normal.

Transmissible Leucosis or Infectious Leukemia

The name transmissible leucosis (infectious leukemia) is applied to a disease affecting the blood and blood-forming organs, in which primitive or partially developed blood cells appear in the general circulation and which can be transmitted experimentally to healthy fowls by injecting into them the blood or tissue suspensions of diseased birds. The method by which leucosis is spread under natural conditions is still unknown despite painstaking studies by investigators both at home and abroad. Apparently the disease is not highly infectious but annual losses are large enough to cause poultrymen grave concern. Cockerels and pullets approaching maturity seem to be most susceptible. Death may occur quite suddenly without any warning but usually a gradual loss of weight accompanied by dullness and weakness, indicates the onset of this disease. As the disease progresses, the face, comb and wattles become very pale and bloodless-looking but in certain cases, disfunction of the liver may induce jaundice followed by a deep yellowish coloration of these head parts as well as the breast muscles. The blood is thin and watery and does not clot easily.

On post mortem examination, the liver is found to be enlarged and varies in colour from normal to a greyish-white mottling of the entire surface and substance of that organ. The kidneys and spleen are usually larger than normal and may also show the same mottled appearance. The upper part of the small intestine nearest the gizzard may present small blood spots visible on the outer surface. There is no satisfactory treatment known for leucosis but strict sanitation and culling of unthrifty birds as soon as noticed will usually control the disease. Where mortality is great, the replacement of the flock from a new source should be considered.

PULLET AFFECTED WITH FOWL PARALYSIS

(Photo, courtesy of Division of Animal Pathology, Science Service, Central Experimental Farm, Ottawa.)

Fowl Paralysis, Range Paralysis

Fowl paralysis is most commonly found in birds between the ages of three months and one year. Lameness is usually the first symptom noticed. It increases in severity until the bird cannot stand. One or both legs or wings, or both legs and wings may be paralysed. Frequently the eye changes colour, producing the so-called "white eye", "pearl eye" or "fish eye". Diarrhoea is sometimes present. In early stages, the appetite may be good but eventually lameness or blindness will prevent the bird reaching the food supply, resulting in death from starvation. Post mortem examination may show tumours on the internal organs and a swollen, water-soaked appearance of the nerves leading to the paralysed limbs. In many cases, the disease has disappeared from flocks after causing serious loss for three or four years. Some persons with practical experience believe that paralysis causes most loss when the resistance of flocks is weakened by internal parasites such as coccidiosis or intestinal worms. Because of the lack of knowledge regarding the disease, it is difficult to make recommendations for its control. Strict sanitary measures during the growing season including the rotation of fields used for range and the immediate removal of any birds showing symptoms, seem advisable. If the percentage of loss in a flock is great, it may be advisable to market the remaining healthy birds and to replace the flock from a source known to be free of the disease, after thoroughly cleaning and disinfecting the poultry buildings.

Visceral Lymphomatosis, Big Liver Disease

This is a condition affecting mature fowls which, as the name implies, leads to enormous enlargement of the liver but may extend to and involve nearly all the internal organs. The enlarged liver may be normal in colour or present a greyish-white mottled appearance due to small closely grouped nodules composed of tumour cells; in other cases large tumour-like nodules of varying size may almost entirely replace the normal liver tissue. The classification of this disease is difficult but its development in mature fowls following inoculation at an earlier date with the blood of birds suffering from transmissible leucosis would seem to indicate a close relationship between the two forms.

6. Non-specific diseases

These diseases differ from those listed as specific diseases in that they are not caused by particular germs or viruses. Included in this group are deficiency diseases, impaction, cannibalism, peritonitis, tumours, reproductive disorders and, bumblefoot.

(*a*) *Deficiency diseases.*—Many poultry diseases are the direct result of deficient diets. A lack of vitamins or mineral elements or of proper balance between the two may result in serious disorders.

Vitamin Deficiency

More is learned each year concerning the vitamins required by domestic fowl. The entire lack of any required vitamin results in a specific disease, while a partial lack may be the cause of unthriftiness.

When vitamin A is lacking in the diet of young chicks, they make poor growth, become partly paralysed, and are unable to walk with a steady gait. There may be soreness of the eyes and small pimple-like spots inside the mouth and gullet. With mature birds, the symptoms are somewhat similar but the eyes become more swollen and both eyes and mouth contain cheesy patches which resemble those found in coryza or roup. This has resulted in this condition being called "nutritional roup". Severe cases are not commonly seen but partial vitamin A deficiency may result where green feed is not plentiful and the birds do not receive cod liver oil. Vitamin A is abundant in leafy green feeds, in yellow corn and in cod liver oil and some other fish oils. Generous use of these materials will prevent vitamin A deficiency.

A complete lack of vitamin B will result in a paralysed condition known as polyneuritis. Vitamin B is fairly abundant in the common grains and this form of deficiency is not common among birds raised under ordinary farm conditions.

When sufficient vitamin D is not present in the diet of a chick and it does not have access to direct sunlight, the condition known as rickets or leg weakness appears. Under ordinary farm conditions, chicks which are enclosed in brooder houses for more than a month and which do not receive vitamin D in some such supplement as cod liver or other fish oil, almost invariably develop a wobbly gait, the joints become enlarged and they eventually lose the use of their legs. The condition is not peculiar to growing chicks but may be found in the form of lameness and paralysis among fowls during the winter months. To prevent rickets, birds of all ages should have access to sunlight when this is possible. When they must be enclosed for extended periods, cod liver oil or other fish oil bearing vitamin D should be added to the diet. Since these oils vary in their vitamin D content, definite recommendations are difficult but, in general, from a pint to a quart of unfortified oils added to each 100 pounds of mash will be sufficient to prevent rickets. It is important that oyster or other marine shells be available to the birds in suitable sizes, at all times, since a plentiful supply of lime is a factor in the prevention of rickets.

Vitamin G contains two factors that are necessary in poultry nutrition. One promotes growth in chickens and among layers is needed to produce good hatchability of eggs. Without it, chicks fail to thrive, their legs become partly paralysed and the toes curve inward. Green feeds, dehydrated alfalfa, milk products, and liver meals are rich in this vitamin. An increase in the milk content of the diet, previous to and during the hatching season, has proved an effective means of increasing hatchability.

The second vitamin G factor prevents the disease known as pellagra. Affected chickens have warty or scabby sores in the corners of their mouths, a sticking together of the eyelids and a cracking of the skin between the toes. The factor preventing this condition is abundant in milk products, alfalfa, wheat bran, and yeast. Pellagra is not common under general farm flock management.

Several newly discovered vitamins, concerning which little is yet known, are said to have some importance in poultry nutrition. Vitamin K assists in the clotting of blood and prevents the profuse bleeding from small injuries which occur when this vitamin is lacking. Alfalfa is considered a good source of vitamin K. Another vitamin is said to prevent what has been called "crazy chick disease" and still another prevents a diseased condition of the gizzard.

Mineral Deficiency

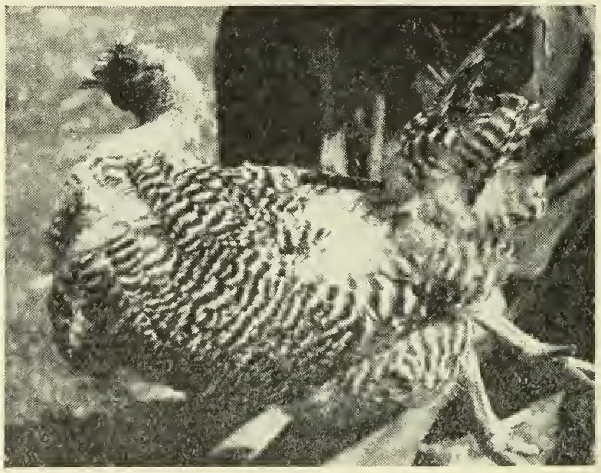
The common grains and their by-products which make up the greater part of poultry diets are relatively low in mineral elements and it is probable that some of these elements may frequently be lacking in feed mixtures. Studies in the mineral needs of poultry have largely been concerned with the amounts of calcium and phosphorus required, because these two elements are needed in much larger amounts than are iron, copper, manganese, iodine, or other mineral elements. Deficiencies of calcium and phosphorus are quite common and result in poor bone formation, lowered egg production and the formation of thin, poor shells. Fish meal, meat meal and milk products are rich in these two elements, both of which are used by the birds to best advantage when vitamin D is abundant in the diet.

One of the most important recent discoveries in poultry nutrition has been the part played by the element manganese in preventing perosis or slipped tendon. This is a condition in which the tendons slide from their normal position at the back of the hock joints to one side and the legs become badly deformed. The hock joint, and sometimes the entire leg, become enlarged. This condition was formerly attributed to a lack of balance between calcium and phosphorus in the diet. Recent experiments indicate that one cause of the condition is a lack of the element manganese in the food supply. Only minute quantities of this element are needed and under most conditions the chicks receive all they require. The common grains vary considerably in their manganese content, oats containing about 12 times as much as corn. The addition of one-quarter pound of powdered manganese sulphate to each ton of feed will correct any manganese deficiency which may occur.

The elements sodium and chlorine, which unite to form common salt, are needed in small amounts by poultry. From one-half to one per cent of salt is usually added to the mash to ensure a sufficient supply.

Deficiencies of iron, copper, and iodine are possibilities, with anaemia and goitre the result where they occur. With present knowledge of feeding, no special addition of these elements is needed.

(*b*) *Impaction or crop bound.*—Impaction may occur in different parts of the digestive tract. Crop bound is a term frequently applied when the impaction occurs in the crop. The condition usually results from birds eating coarse stringy material such as the leaves of dried grass or hay. The passage leading from the crop to the gizzard becomes clogged with this material and all food eaten accumulates in the crop. Without treatment, birds will eventually die from starvation. In early stages it may be possible to work the contents of the crop upward and through the mouth by manipulation. Long standing cases can be relieved by making an incision through the skin and the wall of the crop and removing the contents. After such operation the crop should be washed out and the incisions sewn separately with white silk or cotton thread. Food should be withheld for about 12 hours and following this period, soft food only should be given for a few days. Operation for this condition is simple but rarely pays because of the time required, because of the loss of production which occurs at the time and because the hen with the tendency to eat material which causes the condition will probably continue the habit after operation. It is possible that the craving for the coarse particles of food which cause impaction may be due to an insufficient supply of succulent green feed.



THE RESULT OF FEATHER PULLING

(*c*) *Toe picking, feather pulling and cannibalism.*—Toe picking is a habit of young chicks and feather pulling one of older chicks and mature birds. Both may lead to cannibalism. Feather pulling among laying hens spoils the appearance of the flock but does not seem to lessen egg production. It should be prevented or stopped, if possible, because of the danger of its leading to cannibalism. Sometimes the addition of coarse fibrous food to the diet will help in checking this habit. When it becomes general in the laying flock, the use of mechanical devices which fasten to the beak and allow the birds to eat but not to pull feathers will be of great assistance. Vent shields will aid in preventing cannibalism which follows prolapsus. Control methods for these habits among young chicks are given in Lesson 6. These troubles are most common in flocks which are crowded in houses or range or which have insufficient feeder space. Birds should be well fed and managed in a manner that keeps them busy. Faulty nutrition may be the underlying cause of these habits and this angle should be studied in an attempt to prevent their occurrence.

(*d*) *Peritonitis.*—This is an inflammation of the thin membrane which lines the body cavity and connects the folds of the intestines. It is a common cause of loss among laying hens. The peritoneum, when inflamed, loses its lustrous appearance, becomes dull, thickened, and the surface may be covered with a sticky discharge. Sometimes the body cavity may contain considerable fluid. There may be many causes for this condition—one being the irritation caused by intra-abdominal ovulation. No remedy is known.

(*e*) *Tumours.*—Tumours are relatively common in poultry, occurring mostly among the older birds. They are masses of tissue, usually whitish or pinkish in colour, variable in nature and found on such organs as the ovary, liver, kidney, spleen, pancreas, gizzard, intestine, and muscles. Some tumours grow slowly and do little harm, while others grow rapidly and seriously interfere with the body functions. Some outward tumours can be removed successfully, but most of them are located within the body cavity where removal is not possible. Tumours seem to be more common in some flocks than in others. This has led some authorities to believe that some strains of poultry are more susceptible than others. If such is the case, breeding stock should be secured from flocks which are relatively free. Although some tumours are of virus origin and can be transmitted to healthy birds by inoculation, the actual cause of tumours in general is unknown.

(*f*) *Disorders of the reproductive system.*—The reproductive system of the laying hen is subject to several disorders, the most common being intra-abdominal ovulation, prolapsus, and cloacitis.

Intra-Abdominal Ovulation or Internal Laying

In this condition the egg yolks accumulate in the bowel cavity as they are released from the ovary, instead of passing down the oviduct and being laid in a normal manner. On post mortem examination the abdomen will contain a mass of yolks in an apparent cooked condition. Hens which frequent the nests but do not lay are often affected with this condition. No treatment is known.

Prolapsus or Eversion of the Oviduct

White Leghorns seem more susceptible than other breeds to this condition, which is also known as "blowout" or "pickout" and it is most common with pullets beginning to lay. The eversion frequently follows an egg bound condition and may be partly due to the straining of the bird in an effort to lay. Frequently other birds are attracted by the reddish colour of the protruding part. Their picking at it may lead to cannibalism and has led to the term "pickout" being applied to prolapsus. If the condition is noticed shortly after it occurs, the tissue can be washed and returned to a normal position with the fingers covered with carbolized vaseline. If there is a recurrence, the birds should be disposed of. Pickout shields are mechanical devices which are useful in preventing cannibalism where prolapsus occurs.

Cloacitis or Vent Gleet

This disease is an ulcerated condition of the vent in which the discharge from the sores has a very offensive odour. Doubt exists as to whether or not it is contagious. Applications two or three times daily of mild antiseptic solutions such as mercurochrome or argyrol or at intervals of three or four days with a three per cent solution of chromic acid have been quite effective. Another simple treatment is the dusting into the vent of calcium sulphide.

(*g*) *Bumblefoot.*—This disorder is an abscessed condition of the foot resulting from infection which gains entrance through an injury or bruise. Usually a scab is formed on the bottom of the foot from which pus cores extend upward. The foot may be hot, considerably swollen, and painful. This seems to be a common condition among mature male birds. Treatment is not always successful but is worth a trial with valuable birds. The scab and pus cores should be removed, tincture of iodine applied to the wound and in severe cases the foot should be bandaged to keep it clean. Prevention lies in reducing the chances of injury to the feet by such means as lowering the roosts where they are too high, rounding off any sharp edges from roosts and supplying plenty of litter on the floor.

7. A poultry tonic

With normal, healthy flocks the use of drugs and tonics is not recommended. There are a few cases, however, where a tonic can be used to good advantage such as with old hens at moulting time, pullets which are undergoing a winter moult, or pullets which remain unthrifty and underweight because their ability to digest and assimilate food has been altered by injuries caused by internal parasites. Equal parts of ground ginger, gentian, nux vomica, and iron sulphate mixed together and fed at the rate of one to two tablespoonsful to 50 birds daily in a moist mash is recommended in such cases. As the birds improve in appetite and weight, the amount of tonic should be reduced and finally discontinued.

LESSON 19

THE BUSINESS ASPECT OF POULTRY RAISING

Topics for Study

1. Land requirements.
2. Building requirements.
3. Equipment requirements.
4. Feed and supply requirements.
5. Capital requirements.
6. Sources of income.
7. Cost of producing eggs.
8. Cost of producing meat.
9. Factors which affect profit.
10. Cost accounting.
11. Record keeping.

Most poultry is raised for profit and it is the aim of this lesson to point out some of the more important factors which have a bearing on whether or not a flock will be profitable. These include a study of requirements in land, buildings, equipment, supplies, and capital to get started in poultry raising and a discussion of such accounting and record keeping as are necessary in managing a profitable flock.

1. Land requirements

For ease in making calculations the figures here presented are based on a flock of 1,000 laying hens. From them it will be easy to arrive at estimates for larger or smaller flocks.

Usually the person who keeps 1,000 laying hens replaces between two-thirds and the entire flock each year. If we assume that two-thirds of the flock are to be replaced and study the mortality figures given in Lesson 7 we find that 833 pullet chicks should be brooded for this purpose annually. Since 400 chicks is the maximum number that can be raised safely on one acre of range in a system of permanent poultry production, two acres of range will be required each year. It is unwise to raise chicks on any area of ground oftener than every third or fourth year so requirements for chick range are 6 to 8 acres. One-third more should be allowed if the entire flock is replaced annually and the amount should be doubled if mixed sex rather than pullet chicks are raised.

Additional space will be needed for buildings, for kitchen garden and orchard, for the growing of green feed and for ranging of breeding stock. From 2 to 5 acres should meet these needs. Where grain growing is to be considered, one must count on raising from 5 to 7 acres of grain to supply the needs of each 100 laying hens. About 60 acres of grain will be needed to supply the 1,000-hen flock. In many parts of Canada, poultrymen do not attempt to grow any of their grain requirements.

In Eastern Canada many farms have been laid out in 100-acre lots while in the Prairie Provinces the quarter section of 160 acres is a common unit. In many cases it will be easier to buy a farm of one of these sizes than any lesser amount. Land values vary greatly in different parts of Canada so it is difficult to makes estimates of the cost but it will probably range between $2,000 and $5,000 for land alone in desirable locations. An intending purchaser can best get information on probable land costs within his own province.

2. Building requirements

A laying house for 1,000 hens may be satisfactory under greatly varied details of construction. Two-storied houses are gaining in popularity and it is recognized that buildings at least 20 feet in width are more comfortable than the narrower ones. A building that is 92 feet long by 24 feet wide and two stories high, divided so that each story has a feed room 12 feet wide and four pens each 20 by 24 feet in size for layers will meet most requirements. Construction costs vary greatly in different places and at different times but an insulated house of this size with a concrete foundation will probably cost between $3,000 and $5,000. A cotton-front house with single walls will be correspondingly cheaper.

Three 10- by 12-foot colony houses will be needed to brood the 800 or 850 pullets if these are all bought at one time. If mixed sex chicks are bought, the same three colony houses will serve the purpose if the chicks are of two ages with hatching dates 7 or 8 weeks apart. Colony houses will probably cost between $75 and $100 each.

At the end of the brooding period, the colony houses will be getting overcrowded and half the flock should be moved to range shelters. Naturally, if a second brood of chicks is to be raised, the entire flock will be placed in shelters. There should be 3 or 6 shelters depending on which course is followed. If a second brood is raised, three more shelters, or 9 in all, will be required at the close of the second brooding period. Shelters will cost between $15 and $30 each depending on the size and type of construction.

In addition to the buildings and equipment required for the hens, the owner must have a residence and probably a garage and a building or buildings for storage purposes.

3. Equipment requirements

One brooder is required for each colony house. The price ranges from about $15 for the smallest coal brooders to $50 for well made electric brooders.

Several sizes of feeders and founts are needed to supply the colony houses, range shelters and the laying house. These can be made at home or purchased from poultry supply houses and prices vary greatly.

4. Feed and supply requirements

One hundred laying hens will eat approximately 25 pounds of combined mash and grain daily. On this basis, 1,000 layers will eat about 45 tons of feed annually. In actual practice, reduction in the flock through mortality and culling will lessen this amount somewhat. In the same period they will consume between 1,000 and 2,000 pounds of grit and 2,000 and 4,000 pounds of oyster shell.

Feed consumption tables for growing chicks are given in Lesson 7. From these we can calculate that it will take approximately 12 tons of combined grain and mash to grow 800 pullets to maturity. By securing local prices for feed and using these feed consumption tables it is easily possible to estimate what the cash outlay for feed is likely to be before there is any income derived from eggs or meat. If cockerels are killed at broiler age (about 13 weeks) income will start then.

5. Capital requirements

From the facts and figures given in Sections 1 to 4, local land values, local building costs and prices of feed and equipment, it should be fairly easy to estimate the amount of capital needed to start operating a poultry farm. It is not always advisable for a beginner to start with 1,000 laying hens but this is about the minimum number that will provide a family living.

6. Sources of income

The common sources of income on poultry farms are market eggs, eggs for incubation, poultry meat, day-old chicks, started pullets, breeding stock, manure, feathers, infertile eggs, egg shells and poultry other than chickens. Poultrymen sometimes add to their incomes by acting as agents for equipment and products used in connection with the poultry industry.

CANADIAN EGGS
MARITIME
EGG

MARKET EGGS

The greatest source of income on most poultry farms.

DAY-OLD CHICKS

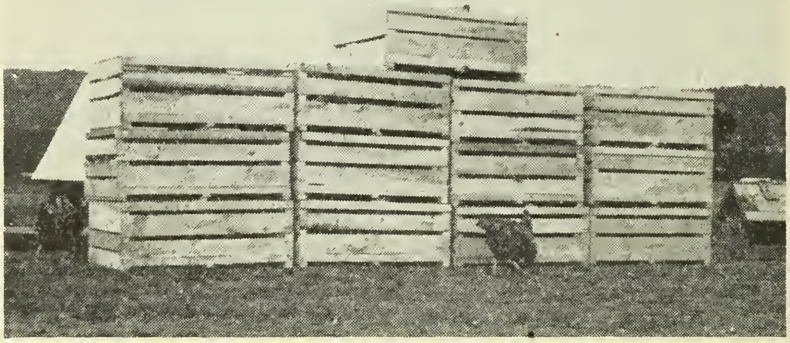
Chick production is a specialized branch of poultry raising.

(*a*) *Market eggs.*—Where surveys have been conducted that cover large numbers of poultry farms, from 60 to 90 per cent of the revenue was derived from the sale of market eggs.

(*b*) *Hatching eggs.*—The present commercial hatchery business requires large quantities of hatching eggs. It is necessary to maintain a high degree of quality in the flocks supplying these. The birds must be rigidly culled, blood tested and, in many cases, mated with R.O.P. cockerels. Hatching eggs bring a higher price than market eggs but it costs more to maintain the flocks that supply them, and a fairly long shipping season is usually required to make their production attractive to producers.

(*c*) *Poultry meat.*—The percentage of income derived from the sale of meat varies greatly, particularly since the practice of chick sexing became popular. Many poultrymen buy pullet chicks only while others buy cockerels only and specialize in the production of meat. Surveys made in the United States several years ago showed that the percentage of income from meat varied from 9 to 37 per cent.

(*d*) *Day-old chicks.*—The production of chicks is a highly specialized business and a large part of it is conducted entirely apart from poultry farms. It is a highly competitive business but has been profitable under efficient management over a period of years. Hatcheries sometimes do custom hatching in addition to producing chicks for sale.



STARTED PULLETS

Crated for shipment to Newfoundland.

(*e*) *Started pullets.*—Many people find it an advantage to buy pullets that are past the stage of development that they need artificial heat. Started pullets are usually sold when from 3 to 8 weeks of age.

(*f*) *Manure.*—It is estimated that 100 hens will produce more than two tons of manure annually. It has a high fertilizing value and where not needed on the farm can sometimes be sold to market gardeners. Unless well cared for there may be a heavy loss of fertilizing elements.

(*g*) *Feathers.*—Feathers are used in the manufacture of mattresses, pillows and other articles as well as in the millinery trade. The feathers of geese and ducks are most valuable but there is also a demand for chicken feathers although the price paid is such that it is seldom profitable to ship them long distances.

(*h*) *Infertile eggs.*—Where large numbers of infertile eggs accumulate, they are usually sold to the tanning trade or operators of fur ranches. In a lesser way they are used at home for feeding the young of all classes of poultry.

(*i*) *Egg shells.*—Only in egg breaking plants will there be great accumulations of egg shells. Their composition makes them valuable as a source of calcium for laying hens.

(*j*) *Agencies.*—Hatcherymen and others often find it provides a service to customers and an advantage to themselves to act as agents for manufacturers of feeds, brooders, feeders, founts and other equipment.

7. Cost of producing eggs

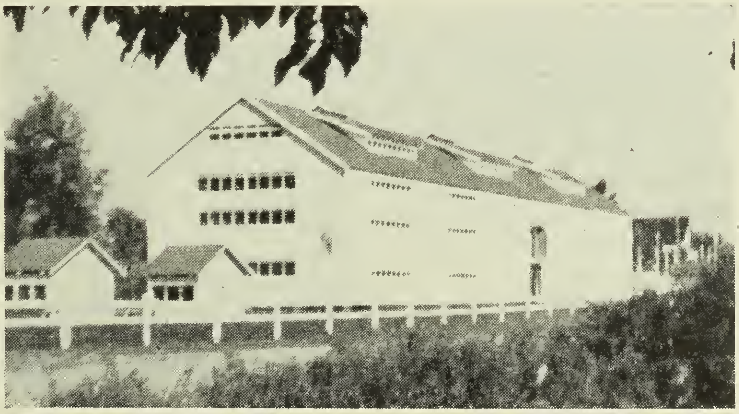
The feed cost is the largest cost item in producing eggs and usually amounts to from 50 to 60 per cent of the total cost while labour costs range between 20 and 30 per cent. Use of land, buildings and equipment make up the remaining costs. The ratio between feed costs and egg prices is closely watched by businesslike poultrymen.

8. Cost of producing meat

On a live-weight basis, it takes about 3½ pounds of feed to produce one pound of broiler meat, 4 to 6 pounds to produce one pound of roaster meat and from 4½ to 6½ pounds to produce one pound of turkey meat. The feed cost represents about one-half the cost of producing broilers. Broiler production is carried on with such a small margin of profit that a few cents difference in feed costs will make the difference between profit and loss.

9. Factors which affect profit

Among the many factors which have a bearing on the possible profits of a poultry farm are the location, ability of the manager, breed, variety and strain of hens kept, size of the business, annual egg production, flock mortality and efficiency with which labour is used.



LARGE-SIZED POULTRY PLANT

Because of efficient equipment, one man can care for 6,000 laying hens in this house.

(Photo, courtesy of Swensson's Poultry Breeding Farm, Aldergrove, B.C.)

(*a*) *Location.*—While there are some advantages in having a poultry farm located near a large centre of population, this is not absolutely necessary but it should be favourably located for the purchase of supplies and for the marketing of its products.

(*b*) *Ability of the manager.*—The poultryman must know how to look after poultry and must apply the knowledge to his undertaking. His knowledge of poultry will enable him to foresee what must be done and to be prepared to do it. It is important that he have good business ability which will enable him to understand the financing of his business and to buy and sell efficiently.

(*c*) *Breed, variety and strain.*—A breed of poultry does not remain popular with commercial poultrymen unless it gives reasonably good egg production.

The poultryman's choice should therefore be limited to one or two of the few varieties with which egg production has been developed. Even within a variety, the choice of strain may be an important factor in making a flock profitable.

(*d*) *Size of the business.*—The size of a poultry business has a definite bearing on the possibility of profit to be made from it. Many farm flocks are too small in size to be economical units. Neither the buying of supplies nor the sale of products can be done efficiently. The labour of caring for a small flock is often out of proportion to the income derived from it. Labour can be better utilized and greater mechanization is possible in larger flocks.

Where surveys have been made of poultry farms, it has been shown that profits increase as there is an increase in both the number of layers kept and the amount of capital invested. It may be unwise for a beginner to start on a large scale but the person who expects to make a good living from his flock must keep at least 1,000 laying hens and will have an investment approximating $10,000. The specialist who has modern equipment will not find it difficult to care for 5,000 or more layers. Farm flocks of less than 100 hens can seldom be cared for efficiently.

(*e*) *Annual egg production.*—A flock must give both high annual egg production and high egg production during the fall months if it is to be profitable. To meet these requirements, a large percentage of the flock must be early hatched pullets.

(*f*) *Flock mortality.*—The income from a flock of any age is greatly affected by the amount of mortality that takes place in it. If the number of actual deaths and the number of birds culled from the flock are together more than 20 per cent of the total number of birds, the income is not likely to be satisfactory. Mortality can be kept in check by buying chicks that are hatched from vigorous stock, that are free from pullorum disease, by proper feeding and by practising sanitation with both old and young stock.

(*g*) *Efficient use of labour.*—The efficient use of labour will reduce the amount of time spent daily in caring for the flock. Water piped to the pens and on the range, feed elevators, dropping pits, hopper feeding and the use of deep litter are all features that greatly reduce the labour in caring for a flock.

10. Cost accounting

It is important with both large and small flocks that some cost accounting should be done. It will show whether or not the flock is profitable and may point the way to improvement in either case. The poultryman should make a yearly "inventory" and keep a "cash account". With these he can "strike a balance" and thus determine the financial standing of the business at any time. Profits on farm business arrived at in this manner are often referred to as "labour income".

(*a*) *Inventory.*—An inventory is an estimate of the value of all articles used in connection with a business. On a poultry farm it will include buildings, equipment, feed and livestock. An inventory can be made at any time but is ordinarily prepared at the beginning of the business year which need not necessarily correspond with the calendar year. In preparing an inventory, the value of different items should be estimated as accurately as possible without too great an expenditure of time. With articles that wear out, the annual depreciation is figured by dividing the original cost by the number of years service the article is likely to give. If the article is five years old, its present value will be the original cost less five times the amount of the yearly depreciation.

(*b*) *Cash account.*—The cash account is a record of receipts and expenses which are listed in separate columns in the order in which they occur. The totals of the two columns can be added at any time but will not show the profit or loss because the cash account does not take into account increases or decreases which have taken place in the values of stock, feed and equipment in the period under review. Inventories at the beginning and end of the period must also be considered in arriving at the financial standing of the business.

(*c*) *Striking a balance.*—Accounts are balanced to show the financial standing of the business. At the beginning of the year, book-keeping starts with charging the amount of the inventory at that time to the business. This is done by setting down the amount as the first item in the expense column. At the close of the year, the amount of the inventory at that time is added as the last item in the column of receipts. Both columns are then added and the difference between them is the "balance" and represents profit or loss. If the sum of the profit column is the greater of the two, the balance is "profit". If the total in the expense column is greater the balance is "loss".

(*d*) *Labour income.*—Farm accounting often differs in two respects from that done in connection with other kinds of business. First, much of the work is done by members of the family who receive no direct payment of wages and, second, the owner does not consider receiving interest on his investment. Thus the profit found by striking a balance is somewhat different from the profits of other businesses where labour costs and interest on investment can be more accurately estimated. The profit arrived at by striking a balance is really a return to capital and labour. If an estimate is made of the interest that should be paid on capital expenditure and this amount is deducted from the total profit, what remains is known as "labour income". This term is widely used in farm book-keeping.

11. Record keeping

The poultryman should not burden himself with needless record keeping but a more common occurrence is that he does not keep enough records for his own interests. Every poultryman should keep an egg production record in addition to the inventory and cash account referred to in Section 10. Records related to feeding, breeding, incubation, brooding and sales all have a value if studied and use made of the information they contain.

(*a*) *Egg production record.*—The owner of a small flock may keep all the egg production record he needs by marking the number of eggs laid daily opposite the corresponding dates on a calendar. In larger flocks where there is likely to be some mortality and some culling in every month, a more detailed record must be followed if it is desired to have a true picture of the percentage production of the flock. The "hen day" basis is the most accurate method of doing this. The number of hens is multiplied by the actual number of days they are in the pen and the total thus secured is divided by the number of days in the month. For instance, if there are 100 hens in the flock on September 1 and 10 are killed on September 11 leaving 90 for the remainder of the month, the number of hens for the purpose of calculating percentage production will be:—

$$\frac{90 \times 30 + 10 \times 10}{30} = 93 \cdot 3$$

When the flock consists of several pens it is usually an advantage to keep such a record for each pen. When figuring egg production on a percentage basis, one egg daily from each hen is considered 100 per cent. If the flock of 93·3 hens laid 1,290 eggs during the month of September, the percentage production is figured in the following manner. One hundred per cent production is $93 \cdot 3 \times 30 =$ 2,799 eggs and the actual production is $\frac{1{,}290}{2{,}799}$ of $100 = 46 \cdot 1$ per cent.

In Record of Performance work under the National Poultry Breeding Program, a detailed record of each hen's egg production is kept.

(*b*) *Feed records.*—The cost of feed is a large item in the management of a flock of any age. A progressive poultryman will want to know the feed cost of producing eggs, broilers, roasters or mature pullets.

(*c*) *Breeding records.*—The keeping of accurate records is fundamental in Record of Performance and other pedigree poultry breeding work. There must be a record of the ancestry of each hen, a record of her egg production and a record of her progeny. Details of all matings are recorded and there must be a record of all eggs incubated because it is from this that fertility and hatchability figures are obtained. Each chick hatched is wing banded and a record kept of its ancestry and its performance. There must also be a record of deaths so that family mortality can be calculated. More improvement is likely to take place in a non-pedigreed flock if records of matings are made and the results studied.

(*d*) *Incubation records.*—Detailed records of all hatches are required of approved hatcheries. These call for such information as breed, date, number of eggs set, source of eggs, number of infertile eggs and dead germs, number of chicks hatched, percentage hatched of all eggs set and disposition of the chicks.

(*e*) *Brooding records.*—The brooding record is mainly one of dates and of mortality. Where known, the cause of deaths should be recorded.

(*f*) *Sales record.*—On large poultry plants it is advisable to keep a record of sales of eggs, day-old chicks, market chicken and fowl. Such a record should show the date of each sale, the name of the buyer, a description of the quality, the quantity and the price. In order that the flock may be duly credited with their value, a similar record of these products required at home should be kept.

LESSON 20

POLICIES FOR POULTRY IMPROVEMENT

Topics for Study

1. The National Poultry Breeding Program.
2. Provincial aid in poultry work.

1. The National Poultry Breeding Program

The National Poultry Breeding Program, as its name suggests, is in operation in all the Canadian provinces. The Program is very broad in its scope, as can be learned by its objects and regulations established under the Live Stock and Live Stock Products Act. The National Poultry Breeding Program as administered by the Dominion Department of Agriculture, in co-operation with the various Provincial Departments, has for its main objective, the distribution of improved poultry stock to Canadian farmers. The Program is divided into three phases: Record of Performance (R.O.P.), Flock Approval, and Hatchery Approval.

(*a*) *Record of Performance (R.O.P.) Policy.*—R.O.P. for poultry is the phase of the National Poultry Breeding Program under which intensive pedigree breeding operations are followed for the production of elite stock. This policy was first put into effect in 1919. Its objectives are:

(1) To encourage the breeding of standard breeds along lines of greatly increased individual family and flock production by the use of a sound basis for selection, i.e., progeny testing.
(2) To give official recognition to records kept by poultry breeders and thus secure reliable information as to sources of improved stock.
(3) To contribute to a more efficient poultry production and make the poultry enterprise more profitable.

The Record of Performance for poultry embraces records of egg production, egg weight, external and internal egg quality, rate of growth, rate of feathering, body weight, body conformation, livability, hatchability and *Standard* qualities. The pullets selected to make up the R.O.P. entry are identified with official leg bands as they commence to lay. In order to determine the value of the various matings of the previous spring, this entry is made up of as many large groups of full sisters as possible. A minimum number of five sisters is required in such groups. Individual egg production over a period of 365 days is determined by the use of trapnests on the breeder's plant.

The standards for qualification as R.O.P. certified are an average of 200 eggs per bird entered, not survivors, for each group of five or more full sisters and 200 eggs for individual birds outside of family groups. In each case, the average annual egg weight must be at least 24 ounces per dozen.

The sires and dams of these groups of full sisters may qualify as progeny tested as follows:

(1) A male having a minimum of 25 pullet progeny entered in R.O.P., at least 20 of which come from 4 dams with not less than 5 daughters each, that have had an average of 200 eggs with an average weight of 24 ounces per dozen.
(2) A hen having a minimum of five pullet progeny from the same sire entered in R.O.P. and that have laid an average of 200 eggs with an average weight of 24 ounces per dozen.

Birds qualifying as R.O.P. certified are used in the breeding pens the following spring to establish new lines and further propagate already proven lines. The breeding pens of all R.O.P. breeders are approved by the Department and all chicks produced are identified by sealed and numbered wing bands. Cockerels obtained from approved R.O.P. matings are eligible for approval as R.O.P. cockerels when mature, provided they have at least two generations of R.O.P. ancestry or are from progeny tested parents. In both instances, the males must show evidence of good growth, vigour, good type and colour and freedom from *Standard* disqualifications and serious defects.

(*b*) *Flock Approval Policy.*—The flock approval policies of the various provinces are drawn up in collaboration with the Dominion Department of Agriculture, and are supervised by the respective provincial Departments of Agriculture. These policies include the physical approval of birds in hatchery supply flocks on the basis of breed standards, health and vigour. In addition, all birds so approved are tested for both standard and known variant strains of pullorum disease and all reactors are removed from the flock.

An approved flock may qualify as a "Canada Accredited Flock" when it has had two consecutive negative tests for pullorum disease, at least 6 months and not exceeding 18 months apart. A Canada Accredited flock can obtain replacement stock only from a Canada Accredited Hatchery, another Canada Accredited flock or a flock with an equivalent standing.

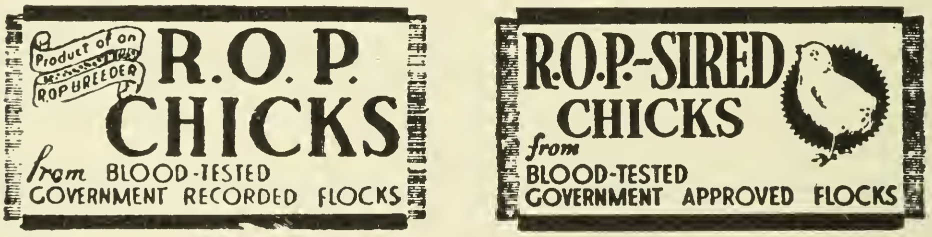
Pedigreed breeding stock produced under the R.O.P. Policy, particularly R.O.P. cockerels, are used extensively in approved flocks.

(*c*) *Hatchery Approval Policy.*—Hatcheries entered under the Hatchery Approval Policy are divided into two groups:

(1) Breeder hatcheries which include mainly R.O.P. breeders who hatch only the eggs produced on their own plants.

(2) Commercial hatcheries where the operator contracts with approved flock owners to supply the hatching eggs. In either case, these hatcheries can only set eggs from flocks that have been officially approved.

A hatchery may also qualify as a Canada Accredited Hatchery, when they accept hatching eggs only from flocks that have qualified as Canada Accredited. Such a hatchery distributes chicks from sources in which no reactors to pullorum disease have been found.


Product of an R.O.P. BREEDER
R.O.P. CHICKS
from BLOOD-TESTED GOVERNMENT RECORDED FLOCKS
R.O.P.-SIRED CHICKS
from BLOOD-TESTED GOVERNMENT APPROVED FLOCKS

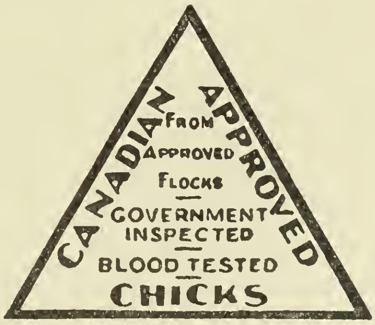
IDENTIFICATION MARKS OF R.O.P. AND R.O.P.-SIRED CHICKS

These marks appear continuously on the gummed tape with which the chick boxes are sealed. Tape for use on boxes of R.O.P. Chicks is printed in purple and that for R.O.P.-Sired Chicks in red.

The three official grades of Canadian Approved chicks are available to poultry farmers through approved hatcheries. These are as follows:

(1) "R.O.P. Chicks". These are pedigreed chicks from qualified R.O.P. sires and dams. Each R.O.P. chick is identified with a sealed numbered wing band, bearing the letters "R.O.P.". These chicks are used mainly for approved flock replacements.

(2) "R.O.P.-Sired chicks". This is the highest grade of chicks produced in commercial quantities. These chicks are sired by qualified R.O.P. males. Their dams may be R.O.P. or approved.
(3) "Approved chicks". These chicks are from matings of sires and dams that have been approved on the basis of physical appearance only.



IDENTIFICATION MARK OF APPROVED CHICKS

The triangle identification mark for Approved Chicks is printed in blue on the gummed tape used for sealing the boxes.

2. Provincial aid in poultry work

Provincial Departments of Agriculture co-operate with the Dominion Department of Agriculture in such activities as the selection, blood testing and inspection of breeding flocks which participate in the National Poultry Breeding Program. Junior poultry club work also is usually conducted under the direction of provincial Departments of Agriculture.

Research work, other than that conducted by the Dominion Experimental Farms Service, extension work among poultrymen, which varies greatly in nature and extent in the different provinces, and instruction in poultry husbandry at agricultural colleges and schools are important activities that are conducted under provincial direction. Some specially valuable publications dealing with different aspects of poultry raising are issued by provincial Departments of Agriculture to supplement those that are available from the Publicity and Extension Division, Department of Agriculture, Ottawa.

Details of the poultry work conducted under provincial guidance may be secured by writing the Departments of Agriculture of the respective provinces.

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GRADE A
LARGE

DOMINION DEPARTMENT OF AGRICULTURE

OTTAWA - CANADA